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ARCHAEOLOGICAL EXCAVATIONS AT THE YARMONY PIT HOUSE SITE
Eagle County, Colorado

Michael D. Metcalf and
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By

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Colorado State Office

Bureau of Land Management

Denver, Colorado

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FOREWORD

One of the most important tools in archaeology for interpreting the past is a scientifically controlled method of excavation that is used to reveal important sites. The Yarmony Pit House excavation demonstrates how an archaeological site that seemingly might not be spectacular on the surface can yield extremely significant data.

This project, undertaken by the Bureau of Land Management and Eagle County, Colorado, represents a major study of a unique archaeological site. Pit house complexes are not particularly common in north central Colorado, so when one is discovered and analyzed, the data gathered is very important. This report represents the culmination of several years of work at the Yarmony Pit House site. It provides valuable data and interpretation for a place that was occupied by humans some 7,000 years ago.

I am pleased to present this significant study to both the professional community and to the general reader as book number 31 in the Bureau's ongoing Cultural Resources Series. These volumes remain popular and continue to contribute to the professional body of literature in history and archaeology. The Bureau of Land Management is pleased to be able to publish information that is both useful and scientifically sound.

Bob Moore

H. Robert Moore
State Director
Colorado

Acknowledgements

A great many people deserve credit for their work and support of the project. Work at Yarmony occurred over the field seasons of 1987 and 1988. The initial phase of work was funded by the Eagle County Road and Bridge Department as part of their upgrading of the Trough Road between State Bridge and Kremmling. Bill Heiden, then the superintendent of the department, and Eagle County Commissioners Bud Gates, Dick Gustafson, and Don Welch are sincerely thanked for their understanding and cooperation following the discovery of this unique and significant site. In addition to providing significant funding, Eagle County altered the road design to preserve a large portion of the site. The commissioners have also encouraged display and public interpretation of artifacts and data from the site.

Work in 1988 and publication of this report was funded by the Bureau of Land Management. This report satisfies, in part, requirements of Contract CO-910-CT8-026. BLM archeologist Prill Mecham was enthusiastic in her support of the work at the site and without her very able help, the project would not have occurred. Prill pushed the project through its various review and permit stages, coordinated site tours for the students of the West Grand School District, and contributed many ideas to the excavations. Frank Rupp (Prill Mecham's successor at the BLM) volunteered time to assist in the excavations, continued the strong BLM support of the project, and reviewed this manuscript. Kremmling Resource Area Manager Dave Atkins visited the site at various stages of work and was also strongly supportive of the work. Publication of this volume was made possible through the efforts of Ric Athearn of the Colorado State Office of the BLM and Hal Keesling of the Craig District Office of the BLM.

Metcalf Archaeological Consultants, Inc. provided a portion of the funding for the project by running additional radiocarbon dates and providing a large share of the salaries for laboratory and report writing personnel. Sally Metcalf is to be thanked for her patience for a project which her spouse pushed beyond the limits of mandated compliance simply out of personal interest.

Students participating in Colorado Mountain College field classes contributed labor to the project in 1987 and 1988. Thanks to Mary Beaumont, Susan Betcher, Norma Broten, Christopher Flanagan, Debbie Garner, Kathy Heicher, Deborah Lind, Jack Niswanger, Sherri Seipel, Judith Touchette, Patricia Walton, and Larry Wood for their efforts. Larry Wood participated in several sessions of work outside of class, and provided photographs for a public display about the site.

A number of specialists were consulted during the course of analysis. Sue Strothers of the U.S. Forest Service, Dr. W. L. Minckley of Arizona State University, and Dr. Danny Walker of the University of Wyoming all helped with faunal identifications. Dr. Shi-Kuei Wu of the University of Colorado identified

the snails. Dr. Craig Shuler of Colorado State University performed the wood identifications.

Local residents William and Bonnie Ellison put up with a crew of archaeologists almost in their front yard, watched over the site in our absence, and provided heavy equipment for backfilling. Their enthusiasm and support was cherished by all of the crew. Alan and Debra Echtler, also neighbors to the site, watched over the site and explained our activities to friends and acquaintances.

Several colleagues visited during investigations sharing ideas, labor and support. Dr. Elizabeth Ann Morris dug with us for several days and participated in many discussions about the site. Bob Nykamp, archeologist for the Routt National Forest brought students and Forest Service para-professionals to the site. Brian O'Neil and Sally Cole, along with other members of the Quahada Chapter of the Colorado Archaeological Society toured the site, as did many of the Roaring Fork Chapter members. Carl Conner and Steve Baker, western slope colleagues also visited the site.

Parts of Chapter 10 of this report were presented as papers at the 1988 Society for American Archaeology and Plains Anthropological conferences. Ideas expressed in this chapter have benefited from comments received at those meetings from discussants Cynthia Irwin-Williams, George Frison, and Chuck Reher and organizers Julie Francis and Mary Lou Larson. Thanks are also due to Tom Green for providing an unpublished paper on pit structures on the Snake River Plain of Idaho.

MAC personnel who participated in fieldwork include Doug Birkholz, Minette Church, Warren and Elke Church, Forrest Crosley, Steve Dominguez, Rand Greubel, Julie Medsker, Sally Metcalf, Jack Niswanger, Bret Overturf, Judy Rau, Debbie Roach, Ron Rood, John Scott, Ed Stine, and Lauri Travis. Excavations were supervised by Mike Metcalf, Kevin Black and Anne McKibbin. Steve Dominguez assisted in a supervisory role when needed, and conducted site tours for the West Grand schools.

The authors were helped with laboratory work by Minette Church, Bret Overturf, Judy Rau, Debbie Roach, and Ron Rood. Anne McKibbin drafted all of the line drawings and maps in the report and was responsible for report production. Tracy Cameron did most of the typing and Sally Metcalf produced the photographs.

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Management Summary

The Yarmony Site was discovered in April, 1987 during routine inventory for widening and upgrading of Eagle County Highway 10. The Eagle County Road and Bridge Department planned a minor re-alignment and depositing "fill" to widen and elevate the road bed across the flat where the site is situated. Initial eligibility testing, consisting of shovel probes and a 1 m^2 test pit, indicated the presence of subsurface materials in at least two horizons. Surface finds of an Early Archaic style side-notched projectile and of apparent grayware ceramics provided some preliminary chronological indicators. Except for the disturbance associated with the existing road, the site was in very good condition. Thus, the site was evaluated as eligible for the National Register of Historic Places and a two-phase data recovery plan was proposed. The initial stage of work was to include 10 1m x 1m test units placed around the site to determine the nature and extent of cultural deposits. The second phase of work was to include an additional 40 to 70 m^2 of block excavation placed in those areas testing showed to be the most productive in meeting the research goals discussed in Chapter 2 of this report.

The expectation was that short-term prehistoric camping activities would be represented in a stratigraphy with several cultural levels present in 40 to 50 cm of Holocene fill. The scale of the data recovery changed abruptly when the tenth and eleventh test units encountered the rich deposits which turned out to be within House 1. Through a series of meetings involving Kremmling Resource Area Manager Dave Atkins, Area Archaeologist Prill Mecham, Eagle County Road and Bridge Superintendent Bill Heiden and Eagle County Commissioners Bud Gates, Dick Gustafson and Don Welch, an increased scope-of-work to include full excavation of House 1 was agreed upon. As excavations proceeded and the truly rare nature of the structure became evident, Eagle County re-designed the road alignment to narrowly miss the house rather than to cut through it as originally planned.

At the conclusion of field work, a temporary fence delineating construction limits on the south side of House 1 was built. Construction of the improved road was completed without additional damage to the site. Some cultural deposits, including a possible prehistoric house structure which is under the original alignment of the Trough Road, were buried more deeply by road fill, but undisturbed areas of significant deposits were avoided.

After the 1987 field season, it was apparent that the Yarmony House was thus far unique in its age, size, and in the richness of the associated lithic and faunal assemblages. The Kremmling Resource Area of BLM proposed the idea of re-opening the pit house as a covered and protected road-side exhibit. At the same time, a number of archaeological questions had arisen concerning the nature of deposits outside the well investigated House 1 area. Two brief episodes of fieldwork occurred during 1988 as a result. The authors supervised a short Colorado Mountain College archaeological field school at the site.

Participants excavated five additional test units which helped to better define the nature of deposits around House 1 and in the Ceramic Locus.

Late in the 1988 field season, the scope of a mitigation services contract between the BLM and MAC was changed to include further evaluation to explore the possibility of opening a roadside exhibit. The scope of this modification (Modification 3, CO-910-CT8-002) included further testing and data recovery in areas which might be affected by development of the roadside exhibit. The funding under this contract was limited to funds remaining after data recovery had occurred at two other sites, 5GA1107 and 5GA660, and thus was not sufficient to complete data recovery in its entirety. It was sufficient, however, to pinpoint areas requiring additional data recovery prior to exhibit construction, and to add significantly to our understanding of the site.

At this time, there are no definite plans to build an exhibit, nor are there any other development proposals which would affect the site. There is time, therefore, to carefully consider alternatives for public interpretation and to consider directions for further research at the site.

CHAPTER 1

INTRODUCTION

by Michael D. Metcalf

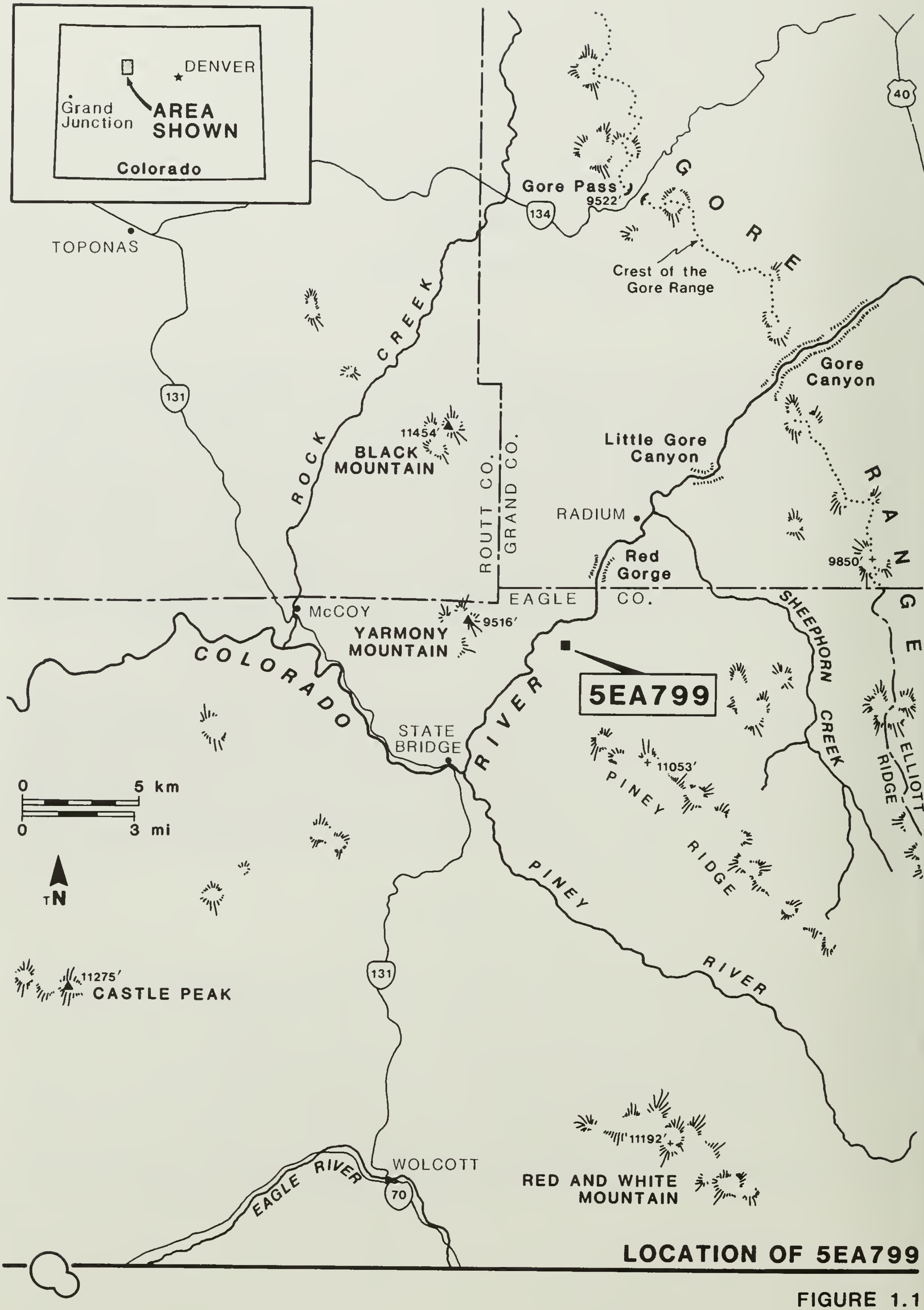
The Site

The Yarmony site, covering about seven acres of Bureau of Land Management administered lands in the Colorado River Valley between State Bridge and Radium (Figure 1.1), preserves evidence of a long sequence of prehistoric occupations beginning about 7000 years ago. At about this time, an erosional event which had stripped topsoil from a wide area around the site halted, and the modern soil began to accumulate. These soils include a valuable stratigraphic sequence which preserves evidence of prehistoric life in the Colorado mountains. Between about 7000 BP and 4700 BP - the Early Archaic period - the site was used repeatedly by prehistoric Native Americans who left behind the remains of their daily lives. Pit houses, animal processing areas, and trash middens found in the site date from this period. During more recent time periods, the site has been used less often, and less intensively, but remains of several later occupations are also preserved.

The site is located on benchland in a broad section of the river valley. In this section, the river is well entrenched in a narrow canyon, but above this trench the valley is relatively broad. Benches, low hills, and a hogback formation are bordered by the steeper slopes of Piney Ridge on the south, and Yarmony Mountain on the north. The site, as well as the mountain and a nearby rail siding, derives its name from a prominent Ute who frequented the area in the late 1800s and reportedly got along well with the local homesteaders (Ewing *et al.* 1976). Various spellings for this man's name include Yarmonite, Yahmonite and Yahmanantz, as well as Yarmony.

History of Excavations

Field investigations at Yarmony have occurred in several episodes. The first were sponsored by the Eagle County Road and Bridge Department in conjunction with a major upgrade project on the Eagle County section of the Trough Road between State Bridge and Kremmling. The site was discovered in April 1987 by Kevin Black during routine inventory of proposed road improvements. Surface evidence, including chipped stone flakes, a projectile point, a few potsherds, and indications of well-preserved soils led to evaluative testing of the site. This initial testing, consisting of a 1 m^2 test pit and 18 shovel probes, showed evidence of two to three cultural levels in soils up to 50 cm in depth, and demonstrated that the site contained sufficient information on Colorado mountains prehistory to make the site eligible for the National Register of Historic Places (NRHP).



LOCATION OF 5EA799

FIGURE 1.1

Following a brief interval during which a data recovery plan was submitted to the BLM and State Historic Preservation Office (SHPO) and approved, excavations at the site began, also in April 1987. The expectations for this work were that two or three use episodes by nomadic hunter-gatherers would be represented. Instead, a pit house dating to about 6300 BP was unearthed, along with evidence suggestive of outdoor activity areas, additional houses, and of overlying, more recent occupations of the site. Eagle County Road and Bridge modified the road design to preserve the pit house, and provided additional funding to complete the excavation of the house.

Over the winter of 1987-1988, preliminary analysis led to questions concerning the nature of cultural deposits outside of the house. Further, some preliminary planning for a covered roadside exhibit including the pit house was also done in conjunction with the Bureau of Land Management. To further investigate the site, five additional test pits were dug early in the 1988 season by participants in a Colorado Mountain College field school with the assistance of volunteers from MAC, providing additional evidence of outdoor cultural activity in the area of the pit house.

Later in the 1988 season, funding became available for small-scale additional work under BLM contract CO-910-CT8-026. During this stage of work, the presence of an additional pit house was confirmed, and a large burned-rock midden area was explored. Further research-oriented excavations and a roadside interpretive exhibit are planned for the future, although a schedule and funding sources are not yet known.

About the Report

The Yarmony site investigations have evolved from an impact-related contract project to an ongoing research project. Large areas of the site, including House 2, remain unexcavated and several potential lines of analysis are unexplored. Thus this report is, in some ways, a progress report. A substantial body of data has accumulated, however, some of which has been briefly reported (Black 1987; Metcalf and Black 1987; 1988a, b, c), but this is the first well-illustrated descriptive report on the site.

Many individuals contributed to analysis and report preparation. Authors of each section are listed, but it should be acknowledged that much discussion of the project has occurred between the various individuals, and many of the ideas and interpretations presented here were arrived at through these group discussions. In particular, Anne McKibbin contributed to the ideas in this report far beyond what is reflected by direct authorship. McKibbin also drafted all of the figures and artifact illustrations in the report. Photographic processing is the work of Sally J. Metcalf.

CHAPTER 2

PREVIOUS WORK AND RESEARCH CONTEXT

by Kevin D. Black

Prior to the survey during which the Yarmony site was discovered, files searches were conducted through the BLM Resource Area office in Kremmling and the Office of Archaeology and Historic Preservation (OAHP) in Denver (Black 1987). Extant data were sparse for this area, with only one historic site and three prehistoric resources previously recorded. The historic site was 5EA575, the old Yarmony Bridge near Rancho del Rio which was demolished and replaced in recent years. Immediately to the west and southwest of the bridge are 5EA45 and 5EA46, two small lithic scatters on sloping benches above the river. All three of these resources lie more than 2 km from 5EA799. The closest previously recorded aboriginal site to the Yarmony site is 5EA157, a rather extensive lithic scatter covering an 11-acre area along McPhee Gulch just south of the Trough Road. Several tools including a perforator, retouched blades, a scraper, a knife edge and point midsection were found here during a Class II survey for the BLM (Fitting 1978), and the site is evaluated potentially eligible for the National Register of Historic Places (NRHP).

During the Trough Road inventory itself (Black 1987), four sites and two isolated finds (IFs) were discovered, including the Yarmony site. Three of the four sites were test excavated; Site 5EA797 is a multiple component Historic period homestead and Late Archaic-Late Prehistoric period aboriginal camp located on the north side of the McPhee Gulch. The Historic period component is the original McPhee homestead, the first white settlement in the area established by the Joseph McPhee family in 1880, but abandoned in 1888 after an especially hard winter (Gentsch 1978). The aboriginal component there consists of an extensive lithic scatter including five tools (two scrapers, a biface fragment and two small corner-notched points) and two fire-cracked rock (FCR) features. Test excavations involved twelve shovel probes, all negative, a 1m x 1m test pit that yielded minimal cultural remains in the upper 5 cm of soil, and attempted salvage of fill from the two fire-cracked rock features. Feature 1 was found to be an entirely deflated, 75 cm diameter cluster of fire-cracked rock with no preserved charcoal or stained soil in association. Feature 2 was investigated in a 2m x 2m excavation, which revealed the remnants of an apparently large hearth or roasting pit badly damaged at some time in the past by heavy equipment. A ^{14}C date on charcoal from Feature 2 is 2110 ± 60 BP (Beta-20744), corrected to 385 B.C. to A.D. 10 at the 95% confidence interval (Klein *et al.* 1982:138). A flotation sample of stained soil from that same feature failed to yield any charred botanical or faunal remains other than charcoal from the fuelwood (Van Ness 1987).

Site 5EA798 is a small lithic scatter on a low, flat interfluvial ridge south of McPhee Gulch. Fifteen shovel probes and a 1 m x 1 m test unit were dug here; three of the probes yielded a single flake and the test pit had highest

flake densities in the upper 5 cm of soil. The only tool from the site is a non-diagnostic point blade fragment. This site is evaluated ineligible for the NRHP. Site 5EA799, the Yarmony site, also was test excavated; those results are discussed in more detail in Chapter 6 of this report. Site 5EA800 is a small, heavily washed lithic scatter on a gentle but very rocky slope near the Echtler Ranch, just west of the Yarmony site. No tools are present and the site has been evaluated ineligible for the NRHP based on surface evidence alone. Isolated find 5EA801 consists of two flakes and a retouched blade tool in an extremely eroded area next to McPhee Gulch. It seems possible these artifacts have been washed down from 5EA157 located directly upstream, where it has already been mentioned that several retouched blade tools were found as well (Fitting 1978). Finally, 5EA802 is another IF consisting of three unmodified flakes on a rocky slope near the canyon rim above Rancho del Rio. The flakes were found in a linear pattern down the slope, suggesting an eroded context, and the rocky outcrops indicate minimal potential for buried material.

The culture history context for this area prior to the Yarmony site excavations is briefly summarized in Black (1987:7-9), from which the following discussion is taken. General culture histories are provided in the relevant RP-3 summaries for prehistory by Guthrie *et al.* (1984), and history by Buckles and Buckles (1984) and Mehls (1984). Several BLM-sponsored Class I overview and Class II sample inventories apply to this region as well. Athearn (1982) and Mehls (1982) provide details on the history of the general area, while Fitting (1978), Lutz *et al.* (1979) and Burgess *et al.* (1980) conducted sample inventories which recorded a number of prehistoric and historic resources. As noted above, however, only Fitting (1978) and Black (1987) have reported on the immediate area, although Kranzush *et al.*'s (1982) block survey upstream above Radium generated some useful information, including radiocarbon dates from test excavations.

Unfortunately, our knowledge of prehistoric events in the project area and vicinity has been hampered by a lack of data from large-scale controlled excavations. Most of the available information derives from surface inventories such as those cited above. These limited data suggest that the earliest inhabitants may have been Paleoindian big-game hunters of the Folsom complex, sites of which generally date in excess of 10,000 years BP. Many Folsom sites and IFs are known in Middle Park (Naze 1986) - where bison herds were observed by early explorers - and Folsom artifacts in a local collection reportedly were found on or near the drainage divide between Wolcott and State Bridge. No evidence of the earlier Clovis complex has been found locally, but widely scattered IFs on the Western Slope suggest these late Pleistocene hunters may have been in the area.

More commonly found are isolated projectiles and, rarely, sites of the late Paleoindian Plano tradition, better known from bison kills on the plains, and of the Great Basin Stemmed Point tradition. Very little is known about the activities of the people represented by these artifacts in the mountains, however. Suspected ages of such remains are from about 10,000 to 8000 or 7500 BP. Sites of the Archaic period date between 9000 and 2000 to 1500 BP in the mountains (Black 1986) and represent a hunter-gatherer lifestyle which persisted locally until the Utes were removed to reservations in the early 1880s. Again, however, most of what we know about this era comes from other areas since few local excavations have occurred. Most larger inventories, including the Trough

Road study, have identified cultural resources of the Archaic period. This probably signals an increase in population over the earlier Paleoindian period, but may be due simply to better preservation and shallower burial of these younger sites.

Beginning in the Late Archaic period, the increase in apparent site density becomes especially noticeable, as demonstrated by radiocarbon data frequencies in central Colorado (Black 1986:214). Table 2.1 summarizes the Late Archaic and Late Prehistoric period radiocarbon dates garnered from sites in the project vicinity. This list does not include the voluminous data from Vail Pass, which yielded 28 ^{14}C dates between 3420 and 190 BP, with significant date clusters at 2860 to 2700 BP, 2260 to 2100 BP and 990 to 720 BP (see Gooding 1981:12).

Table 2.1

Late Archaic-Late Prehistoric Radiocarbon Dates in the Project Vicinity

Uncorrected Date, Yrs BP	Lab #	Site #	Reference
775 ± 75	UGa-4499	5GA698	Kranzush *et al.* (1982)
795 ± 230	UGa-4501	5GA701	Kranzush *et al.* (1982)
995 ± 80	UGa-4498	5GA696	Kranzush *et al.* (1982)
1230 ± 60	Beta-23787	5EA799	this report
1450 ± 295	UGa-4500	5GA700	Kranzush *et al.* (1982)
1610 ± 55	Dic-1256	5EA128	Hand and Gooding (1980)
2070 ± 90	Beta-22626	5EA810	BLM site files
2100 ± 60	Dic-1257	5EA128	Hand and Gooding (1980)
2110 ± 60	Beta-20743	5EA797	this report, Black (1987)
2890 ± 60	Beta-20743	5EA809	Rood (1986)
2910 ± 55	Dic-1195	5EA128	Hand and Gooding (1980)

The advent of bow-and-arrow and ceramic technology marks the beginning of the Late Prehistoric period in the mountains by 2000 to 1500 BP or perhaps a little earlier. Sites of this age are especially common locally, but show virtually no change in lifestyle compared with the Archaic period. An increase in the diversity of site types is apparent (e.g., eagle traps, wickiups, rock art, etc.) but, again, better preservation may be an important factor. The Utes were the last hunter-gatherer group known to have inhabited this area in the Late Prehistoric period, and their culture is best known from descriptions of the last 150 years when acquisition of horses, guns and other exotic items from contact with Euro-American explorers and settlers had altered their original cultural patterns to a significant degree.

Both early geographic surveys and more recent historical accounts place the Yarmony site along the route of an old Indian trail, the same one followed by the McPhee family in their search for a place to homestead in 1880 (Gentsch 1978; Hayden 1881). The Hayden Survey team mapped the route of this trail from the lower Blue River Valley below present-day Green Mountain Reservoir, crossing the Gore Range at Dice Pass just south of Sheephorn Mountain and Dice Hill. West of the Yarmony site, the trail maintained its elevation on benches above the east side of the Colorado River, then crossed the Piney River above State

Bridge. At this point the trail turned south, roughly along the route of present-day Highway 131, and connected with another trail in the Eagle River Valley at Squaw Creek between Wolcott and Edwards. It seems likely that another trail branched off near State Bridge to follow the Colorado River westward to the well-known trail system across the Flat Tops, but this is not depicted on Hayden's maps.

To early settlers the portion of the trail in the Yarmony site area - quickly upgraded to a wagon road - was known as the Colorow Route after the infamous Ute Indian who gained special notoriety for his involvement in the White River Agency uprising of 1879 (Athearn 1982:48-54). Today's Trough Road follows the old trail route in only certain areas, including the Yarmony site locale, but it would be speculative to assume that the trail had been established through the site area when Yarmony was first occupied some 7000 to 8000 years ago.

The Historic period in this area applies to only the past one hundred years for two major reasons: the Utes were not removed to reservations until 1881, and railroads were not completed along the Colorado River until about 1907. Early historic activity in the area mainly involved homesteading for ranching pursuits, while mining occurred in more distant locales. It has been noted that the Joseph McPhee family was the first to homestead in the area, building their first home at 5EA797 in 1880. They brought pack horses and a dairy cow with them, and initially supported themselves by hunting locally and selling the excess meat in Breckenridge. Eventually they were able to acquire and build up a herd of cattle, maintained through the winters on hand-cut and mown grasses harvested from a number of local meadows. They also grew some vegetables, including storable goods such as potatoes, which they kept in a root cellar built into the slope of a low shale ridge north of their cabin. Local place names such as McPhee Flats, McPhee Gulch and Garden Gulch stand as historical reminders of their pioneer activities (Gentsch 1978).

Once the Utes had been removed to reservations and Western Slope lands made available for Euro-American settlement, the old Indian trail followed by the McPhees to their first homestead became a more heavily traveled wagon route, albeit a primitive one. Just below McPhee Flats and the Yarmony site, a ferry was built across the river in the early 1880s and maintained by another early settler in the area, Al Rundell. This provided access to the north side of the Colorado River for those not headed downstream on the main Colorow Route (ibid.). Another well-traveled section stretched from Wolcott to Steamboat Springs along present-day Highway 131, primarily for transport of cattle. Once a steel bridge was completed across the river at State Bridge in 1890, travel along this stage route was certainly facilitated. The last significant addition to local transportation came with the building of the railroad from Denver to Craig (the "Moffat Road"); milestones include reaching Kremmling in 1906, through Gore Canyon to Radium and Yarmony station in 1907, and to Steamboat Springs in 1909 (Vandenbusche and Smith 1981; Gentsch 1978).

The Moffat Road was first organized as the Denver, Northwestern and Pacific Railroad in 1902, but was reorganized as the Denver and Salt Lake Railroad (D&SLR) in 1913 two years after David Moffat's death. The final chapter in local rail history was written when the Denver and Rio Grande Railroad (D&RG) bought out the D&SLR in 1932, then completed the "Dotsero cutoff" from Bond to the

existing D&RG line at the confluence of the Eagle and Colorado Rivers in 1934 (Vandenbusche and Smith 1981:100-102). Completion of the railroad through Radium was especially significant to local ranching interests, by 1907 concentrated in the Sheephorn Creek valley, since cattle could now be more quickly shipped to eastern markets instead of slowly driven to the D&RG railroad connections at Wolcott (Gates 1950).

Relatively less important to the local economy has been mining, with exploration activities widely scattered around the region, but no major mines were ever developed. Gold was the first mineral sought locally, as early as 1888 in placer deposits of the Colorado River as well as in hard rock exposures. Small amounts of copper also were produced from a number of mines, most prominently around Copper Spur in the first decades of the 20th century. Production was promising enough that a processing mill was built there in 1915 (Ewing *et al.* 1976:37). The hamlet of Radium east of Yarmony got its name in 1906 from the radium content in a local mine operated by Harry Porter, but no significant amounts of that mineral were ever produced (Eichler 1977).

Recreational activities such as hunting were also popular in early days, and have become increasingly important to the local economy with rising interest in such sports as fishing and river rafting.

Data Gaps

The preceding discussion on known culture history, and particularly the more detailed summaries in the above-cited references, highlight a number of areas where large gaps in our knowledge of local prehistoric adaptations are present. Considering the relatively few excavation programs completed to date in the Yarmony region, it is striking that absolute chronological data have been limited to the Late Archaic-Late Prehistoric time frame, i.e., the post-3000 BP era. Yet survey and excavation results from Middle Park, Vail Pass and other surrounding locales clearly demonstrate the potential for earlier Archaic and Paleoindian remains in this portion of the mountains.

In the RP-3 summary for the Colorado mountains (Guthrie *et al.* 1984:20), the authors note that so little is known about the Paleoindian period in the high country that data gaps include virtually every relevant topic pursued in current research, from chronology to settlement and subsistence. The Caribou Lake site, a Cody complex occupation dated to ca. 8460 BP on the west side of the Front Range (Benedict 1974), is the only excavated Paleoindian component in this portion of the mountains, and even it yielded only very limited lithic remains; the Yarmony site, given this context, was not expected to yield any new data on this poorly understood period.

During the lengthy Archaic time frame, our knowledge of events in this region increases only slightly and, as mentioned, much of that evidence consists of chronological data from the Late Archaic period. Guthrie *et al.* (1984:37) emphasize data gaps in the general areas of chronology, cultural affiliations, and environmental influences on mountain settlement. Certainly for the earlier Archaic interval the data gaps approach the across-the-board need for information evident in Paleoindian studies. In the Late Archaic period, the Dotsero burial has provided significant data on mortuary practices at ca. 2900 BP - the interment was a crevice burial in semi-flexed to flexed position, of a 30 to 35-

year old male accompanied by corner-notched points and the bones of several birds and mammals (Hand and Gooding 1980). However, other aspects of Late Archaic adaptive strategies, such as subsistence practices, remain somewhat cloudy. This is despite the fact that some well-known Late Archaic sites have been excavated in the mountains, among which could be named Carter Gulch, Park Cone, Runberg, Porcupine Peak, Campion Hotel, Vail Pass and Blue Lake (Black 1983, 1986; Marcotte and Morris n.d.; Buckles 1979; Gooding 1981; Benedict 1979a). The Yarmony site was felt to have good potential to address certain pertinent issues in Archaic period prehistory.

As might be expected, data gaps for the most recent Late Prehistoric-Protohistoric time frame are more detailed, owing to the larger amount of information available on general issues like chronology, subsistence and settlement. A multitude of sites have been dated, especially for the first millennium A.D., and many of these contain floral and faunal remains while others in combination exhibit the diverse range of structural types found in this period: stone circles, wickiups, lean-to shelters, tree scaffolds, eagle traps and other rock-lined hunting blinds have been identified. Guthrie *et al.* (1984:44, 51) highlight the lack of data regarding the possible extent and duration of mountain occupation by formative stage groups, if any, during the Late Prehistoric period, and note the surprising lack of information on chronology and cultural affiliation for the Protohistoric period.

This latter point is perhaps the most puzzling aspect of Late period mountain archaeology - similar styles of small corner-notched points are called Rose Spring on the Western Slope and Plains Woodland ("Hogback") in the mountain parks and eastern ranges, with no clear indication of true cultural affiliations, relationships between eastern and western groups, or even if a cultural distinction is actually represented. Once that arrow point style disappears around 800 to 1000 BP, the picture becomes even more muddled with identifiable Ute sites not clearly represented until ca. 400 to 500 BP, and with no reliable archaeological technique for distinguishing Ute from other ethnically distinct groups like Arapaho and Cheyenne in the Protohistoric period. The Yarmony site, with its distinctive ceramic artifacts, held out the hope that some new information might be forthcoming to address these issues. In the following section, MAC's research design for the Yarmony excavations is presented, including our theoretical framework in studying such hunter-gatherer sites, research goals and methods, and specific expected results.

Research Design

Once the limited testing phase at Yarmony had clearly shown the site was eligible for inclusion on the NRHP (Black 1987), a mitigation plan was developed for the site which included a brief description of known site contents and suspected stratigraphy, research goals, methods for data recovery, and specific data recovery tasks to be completed. This plan was transmitted to the BLM in a letter report dated April 9, 1987; the plan is excerpted in the research goals and expectations section below. As will become clear in later chapters, our expectations for the Yarmony site were far exceeded by excavation results. It has become increasingly apparent over the past few years that limited test excavations are poor predictors of the volume and character of archaeological remains, both in mountain sites and elsewhere. What follows is a discussion of the theoretical framework for the Yarmony excavations, taken from another recent

mitigative excavation program of MAC's in the Colorado Rockies (Black 1986:15-22); our emphasis is on cultural ecology.

Research Goals and Methods

As previously discussed, the Colorado River valley in the Yarmony region is known to contain areas of high site density (e.g., Lutz *et al.* 1979), but large-scale excavations have been the exception rather than the rule. Thus, conclusions about the local archaeological record have been largely based on evidence from surface artifacts, and on inferences drawn from work in surrounding areas. While our general description of prehistoric events in this part of the mountains probably is accurate, details about the sequence and chronology of local occupations, the subsistence orientation of the inhabitants, season(s) of use and the nature of the activities carried out at sites are essentially unknown. Research at Yarmony thus had several goals:

1. Determine the nature and extent of subsurface cultural deposits at the site.

2. Establish a chronological record for the apparent stratigraphic sequence through radiocarbon or other dating methods.

3. Utilize the artifact assemblage of each component for a functional analysis to determine the range of prehistoric activities.

4. Obtain and analyze faunal remains and macrobotanical samples to gain an understanding of subsistence and seasonality.

5. Collect soils, pollen and other appropriate samples as an aid to geomorphological and paleoenvironmental reconstruction of the site setting.

Expected Results

In addition to the above, the more general data gaps spelled out in the RP-3 document (Guthrie *et al.* 1984) were to be addressed insofar as possible. The diagnostic ceramics and side-notched projectile point base found during the testing phase at Yarmony led to expectations that we would be able to investigate issues pertinent to the Early Archaic and Late Prehistoric periods, as outlined in the preceding sections. Thus, we expected to recover data regarding the chronology and cultural affiliations of an aboriginal group producing (or trading for) a locally unusual ceramic type. Also, we were hopeful of adding to our knowledge of subsistence pursuits in the Late Prehistoric period, and to identify the potential range/territory of the group(s) as expressed in the range of lithic material types present.

For the presumed Early Archaic component, more general expectations were held. The structural remains found elsewhere in Early Archaic contexts made us aware of the possibility of such remains at Yarmony, but Archaic architecture has not been found in high enough frequencies to warrant more than vigilance in excavation, as opposed to an expectation for structural remains. Firmer expectations were that we could add to the limited knowledge of subsistence,

site structure, seasonality, chronology and cultural affiliation in the Early Archaic period. Finally, we expected on less certain grounds to address the recently formulated hypothesis regarding long-term permanent occupation of the high country as opposed to seasonal settlement and winter abandonment. The former hypothesis has been advanced by Black (1986, n.d.) in a construct called the Mountain Tradition which contrasts with Benedict's (1978, 1979) well-known "Altithermal refuge" hypothesis.

It can be seen that the specifics of our research design did not take the form of explicitly stated hypotheses, test implications and procedures broken down by topic, as many recent efforts have been organized (e.g. Black 1986). The reasons for this are many, not the least of which was the very short time span encompassed between completion of the testing report and mitigation plan, and returning to the field to implement data recovery. This tight scheduling was necessitated by the construction schedule of ECRB, as well as due to the rather unanticipated extent of buried materials found in excavations. Also, the limited testing program itself did not generate enough specific data on remains at the site to allow for much more than general statements on research goals. The interpretations and conclusions presented in Chapter 10 of this report, however, should allow for development of more specific research designs in future excavations within this region.

In order to accomplish those research goals, two stages of work were proposed for data recovery. The initial stage was further testing to be used as an aid in determining the best locations for data recovery to take place. Ten 1m x 1m test units - three south of the road and seven north of the road - were proposed for this effort, and eleven total were eventually completed with two, rather than three, placed south of Trough Road. Based on the results of this work an additional 40 to 70 m^2 of excavation was proposed, with these units to be distributed in one or more blocks placed in areas of concentrated prehistoric activity. The exact level of effort could only be determined during fieldwork, but a minimal level of effort was expected to total about 50 m^2 or about 1% of the site area. The final total dug was just over 120 m^2, not including backhoe trenches.

The intent of the initial ten test units was to get a representative spatial coverage of the site area. Units were to be excavated within a grid which would be established prior to testing. Subsequent placing of excavations units also was to be within the grid with blocks of contiguous 1 m squares being excavated. These blocks were to concentrate on the most productive site areas. Measures of "productivity" are geared to research goals and include presence of such features as hearths, middens, structures, or activity areas, good level definition and preservation, artifacts which are useful for either temporal or functional interpretation, and the presence of charcoal or other datable material for chronological placement of occupations. Excavation blocks were proposed so that the activity areas associated with features could be adequately exposed and mapped. Based on the depth of materials in the initial test pit and shovel probes excavated in the testing program, units were expected to penetrate to 40 to 50 cm below the ground surface.

The maximum level of excavation was not to exceed 100 m^2 unless unusually significant cultural remains were unearthed. Based on testing, two or three stratigraphic components were expected with a time range of about 6000 years

possibly represented. Each component was expected to be a small seasonal camp or a site where some processing or extractive task was carried out. Examples of highly significant but unexpected types of remains include habitation structures such as house pits, major bone beds resulting from communal kills, and camp sites predating 7000 BP.

The proposed range of excavation effort then was 50 to 100 m^2 or 1% to 2% of the site area. The minimum level was to be excavated if research goals could not be addressed with the type of information being retrieved or if the research potential had been exhausted. The maximum of 100 m^2 was to be excavated if large area exposure was needed to gain an understanding of the nature of site activities, or if the locations of significant materials at each stratigraphic level required exposure of cultural deposits at separate site localities.

Specific Data Recovery Tasks

The following is the list of specific tasks which were felt to be necessary to accomplish the research goals:

1. Review of existing survey and excavation literature for the area.

2. Establishing a permanent site datum and placement of an excavation grid over the site.

3. Controlled surface collection.

4. Hand excavation of 50 to 100 m^2 of clayey matrix 40 to 50 cm in depth using 5 cm vertical control.

5. Collection and analysis of approximately four or five radiocarbon samples.

6. Collection and analysis of flotation samples for all hearth features encountered during excavation.

7. Detailed analysis of natural stratigraphies for geomorphological and paleoenvironmental reconstruction.

8. Analysis of all lithic, ceramic and faunal remains.

9. Preparation of a publication-quality technical report covering all aspects of the investigations.

10. Curation of all collections at a BLM approved facility.

As will be seen below, all the data recovery tasks outlined here were accomplished beyond expectations, and research goals likewise have been far exceeded by the results of excavations. Further details on the specific field and lab methods used to complete the project are provided in Chapter 4.

CHAPTER 3

ENVIRONMENT

by Kevin D. Black

The Yarmony site is located between State Bridge and Radium in northeastern Eagle County (see Figure 1.1). This location is on the southeast side of the Colorado River valley, on the west margins of the Gore Range within the Southern Rocky Mountains physiographic province (Thornbury 1965:349). Elevation of the site is 7140 ft (2176 m).

This portion of the river valley is relatively open (Figure 3.1), but impressive canyons are nearby both upstream and downstream. Upstream to the northeast the Colorado River leaves Middle Park via the deepest of the three canyons through the Gore Range: the 2600-ft (800 m) deep defile of Gore Canyon. Just below Gore Canyon is the much smaller but relatively long cut locally known as Blacktail Gorge or Little Gore Canyon. The last of the three Gore Range canyons is a prominent feature of the landscape as seen from the Yarmony site, Red Gorge, whose walls tower 1700 ft (520 m) above the river.

Yarmony lies 1 km south-southeast of the river, where it winds its way through a shallow (200 ft/60 m deep) trench cut into the surface of an ancient terrace. The site lies on the upper margin of this terrace, overridden in Pleistocene times by a landslide deposit originating on the north slopes of Piney Ridge (see Chapter 5). Downstream from Yarmony the Colorado River passes through less well-defined canyons, the closest to the site being the unnamed cut between Yarmony Mountain and Piney Ridge near State Bridge. Below the railroad hamlet of Bond, the river enters the widest portion of its valley in this region, where access to the river is easiest and aboriginal resources are known to be abundant (Lutz *et al.* 1979). In the previous chapter, it was noted that early maps showed an old Indian trail in the Yarmony area, and it is quite apparent that the trail route over Dice Pass was chosen to avoid the rugged canyons cut by the river in this region.

In detail, then, the Yarmony site is topographically bounded on the north by the Colorado River and, beyond it, Black Mountain (Figure 3.2); on the east by several low spur ridges of the Gore Range; on the south by Piney Ridge; and on the west by the river and Yarmony Mountain. Specific locations and elevations of these features are depicted in Figure 1.1, but in sum it can be said that subalpine and timberline elevations of 9500 to 11,500 ft (2900 to 3500 m) are relatively close to the site. Although local gradients in the site area are quite gentle at 2 to 5° to the north-northwest, much steeper slopes are present in the immediate surroundings such as the flanks of Yarmony Mountain and Piney Ridge where 25 to 35° hill slopes are typical. The jagged walls of Red Gorge and Gore Canyon are even more precipitous, exceeding 40°, but in the site area gentler slopes of less than 10 to 15° are the rule.

FIGURE 3.1

View southwest down the Colorado River valley. The Yarmony site is on the extreme left edge of the photo. The south flank of Yarmony Mountain is on the right horizon. McPhee Gulch is marked by the band of deciduous trees.

FIGURE 3.2

View north across the Colorado River valley from the Yarmony site. McPhee Gulch flows right to left at the base of the juniper-covered slope in the midground. Black Mountain is on the horizon.

Given the proximity of the river and, from late fall through early spring, ample snowpack, it is clear that water was not a problem for the site inhabitants. Numerous tributary streams and springs, most of permanent flow, also enter the river in this region. Most prominent on the north side of the river are Yarmony Creek, Sheep Creek and Blacktail Creek - all above Red Gorge - and Rock Creek below State Bridge. More accessible to the Yarmony site are the southern tributaries such as Piney River entering the Colorado River at State Bridge, and both Cottonwood Creek and Sheephorn Creek to the east, also above Red Gorge. Locally, Garden Gulch and McPhee Gulch pass through McPhee Flats just east of the site; both are intermittent drainages fed by springs issuing from the north flank of Piney Ridge. It may be worth mentioning that the drainage called Garden Gulch in Gentsch (1978) apparently is the McPhee Gulch drainage shown on USGS topographic maps, as Garden Gulch is depicted as the next named drainage west only on the 1:50,000 scale county topographic map.

The Yarmony site lies at the upper elevational margin of the area of reduced snowpack in this stretch of the Colorado River valley. In most winters, consistently deep snowpack is present on all of the higher slopes surrounding the site and, in the valley, immediately above Red Gorge. Beyond the Gore Range, Middle Park also experiences less snow at its lowest elevations, but that mountain park is appreciably colder than the Yarmony area. However, some winters can be exceptionally snowy on the Western Slope regardless of elevation, with two to three feet of snow in valley bottoms lasting a month or more characterizing the recent winters of 1981-82, 1982-83, and 1988-89. Specific climatic data are not available for the immediate site area, but roughly comparable environments are documented from nearby valley stations. The locations of Eagle, at 6500 ft (1985 m) elevation, and Kremmling, at 7400 ft (2255 m), bracket the elevational range of the Yarmony site environs. Thus, it can be surmised that the Kremmling data reflect slightly wetter and colder conditions, while the Eagle station is probably a bit warmer and drier than Yarmony - but neither disparity is of any significant magnitude.

Geology, Soils and Lithic Resources

Because a detailed treatment of the geomorphological setting at Yarmony is presented in the following chapter, the information presented here will be brief in its specifics and more general in scope. Several published articles, theses and dissertations discuss the extremely complex and highly faulted geologic structure of this portion of the Gore Range (e.g., Donner 1949; Gates 1950; Steinbach 1956; Schmidt 1961; and Brennan 1969), summarized in map form by Tweto *et al.* (1978). Stratigraphically, a remarkable number of formations outcrop in the area, having important implications for the availability of a wide variety of exploitable toolstone. Oldest are Precambrian metamorphic rocks exposed in the Gore Range core area of Red Gorge and Gore Canyon. These formations include granites, biotitic gneiss and schist, and migmatite; in the Yarmony assemblage, a few artifacts of gneiss and schist are represented as manuports and ground stone implements. The better preserved specimens exhibit smooth, water-worn cortical surfaces indicative of procurement within the nearby river gravels rather than from the more distant outcrops to the east.

At least eight sedimentary and metamorphic formations of Paleozoic age (Cambrian through Permian periods) are represented in local outcrops, mainly north of the Colorado River around Black Mountain, and some of these are known

to yield usable toolstone. From oldest to youngest, these are the Sawatch, Parting and Dyer (Chaffee), Gilman, Leadville, Molas, Minturn, Maroon and State Bridge formations, but these materials are generally too coarse-grained to be easily knappable and, in any event, the few quartzites represented in the Yarmony chipped and ground stone appear to be derived from later Mesozoic outcrops. Sandstone suitable for manufacture into milling implements can be found in the Gilman, Minturn, and Maroon and State Bridge formations. The latter two, however, occur in bright shades of orange, maroon and red which are not represented in the Yarmony assemblage. The Gilman and Minturn formations are more brown to buff colored, as is the Yarmony ground stone, but their outcrops are more distant from the site than similar-looking Mesozoic sandstones and so are less likely candidates to have been quarried by the site occupants.

Limestone, dolomite and conglomerate occur in the Leadville, Molas, Dyer and Minturn formations, and could have provided knappable chert in nodular form. In particular, the Molas-Leadville formation contact is suspected to yield usable cherts in shades of brown, gray and white based on material type frequencies seen on sites in the northern Sawatch Range (see Black 1986). However, primary quarries have yet to be identified and secondary quarries in lag gravels suggest other formations such as the Manitou, Belden and/or Browns Park may be the host rocks (e.g. Anderson 1980:349-354). Siltstones also are available in the Maroon and State Bridge formations but, as with the sandstones in the same formations, these are brightly colored and are not seen in the Yarmony assemblage.

Mesozoic age deposits (Triassic through Cretaceous periods) outcrop locally in the State Bridge, Chinle, Entrada, Morrison, Dakota, Benton, Niobrara, and Pierre formations (oldest to youngest).

The older, pre-Cretaceous units generally outcrop in bands north and west of the river, while the younger formations are more common in the site locale south of the river. Most prominent are the State Bridge - exposed in its thick type- section on the slopes of Yarmony Mountain - the Dakota formation forming a distinctive hogback just northeast of the site, and the Pierre shale with its landslide-dominated topography much in evidence on the slopes of Piney Ridge (see Brennan 1969:46). The geologic map of Brennan (1969) places the Niobrara formation beneath the Yarmony site location but, as noted in Chapter 5, the basement soil at the site is developed in a landslide deposit from the Pierre formation originating from the Blas Spring area on Piney Ridge. Toolstone in these Mesozoic formations is dominated by sandstones, quartzites, and cherts from the Dakota-Morrison section; the Yarmony assemblage includes many ground stone items, but few chipped stone artifacts, that likely were quarried from the nearby outcrops of these two formations. Two other possible sources of toolstone include petrified wood from the Chinle siltstones, and chert from the "Gartra Grit" between the Chinle and State Bridge sections (Schmidt 1961; Brennan 1969), but there is little evidence of either in the Yarmony assemblage.

Middle to Late Tertiary and Quaternary rocks complete the local inventory of outcrops. Most in evidence are intrusive and extrusive igneous formations on the upper slopes and crests of Piney Ridge, Yarmony Mountain, and Black Mountain. Basalts, andesites, rhyolites, and porphyritic rocks are represented; dark gray to black basalt cobbles from lava flows on Piney Ridge are common inclusions in the Holocene soil section at Yarmony. A few chipped and ground

stone artifacts of the full range of dark-colored and lighter-colored igneous types are present at Yarmony.

However, the bulk of the Yarmony site chipped stone artifacts are light-colored cherts, chalcedonies and agates quarried from local outcrops of the Miocene-age Browns Park formation. The Browns Park is largely equivalent to the Troublesome formation of Middle Park; both contain siltstone, sandstone and conglomerate mixed with dispersed to dense beds of volcanic ash and tuff. The Troublesome formation is well-known as a toolstone source in Middle Park (e.g. Jones 1979:64-66; Gooding 1981:19; Benedict 1985:10), and the Yarmony artifacts from Browns Park outcrops are identical to those Middle Park materials. Tweto *et al.* (1978) map three large areas in the Browns Park formation near Yarmony: in the Sheephorn Creek valley from the vicinity of Dice Pass northward through Hartman Divide, on both sides of the Piney River below Muddy Creek Pass, and between Alkali and Willow creeks southwest of State Bridge. The Sheephorn creek source is the closest to Yarmony, only 6.5 to 10.5 km to the northeast, and the lower Piney River outcrops are only slightly more distant. The BLM has recorded one quarry near the Hartman Divide (Prill Mecham, personal communication 1987), but much of this material is a fine-grained gray quartzite only rarely represented at Yarmony.

The other major source of toolstone for the Yarmony inhabitants lay in the alluvial gravels of the Colorado River and its major tributaries. Many of the chipped and ground stone artifacts in the collected assemblage exhibit well-smoothed waterworn cortical rinds, and clearly indicate that the river gravels were commonly scrutinized for usable materials. More prevalent in the chipped stone, however, are the rough-textured cortical surfaces of Browns Park/Troublesome chert artifacts indicative of procurement from primary and colluvial gravel outcrops - the sheer quantity of Yarmony artifacts exhibiting such cortical remnants is the best evidence available for local procurement as opposed to curation of exotic (non-local) toolstone.

Soils developed on the Cretaceous sediments underlying the Yarmony site are described in more detail in Chapter 5. Briefly described, the subsurface section includes three paleosols bounded by unconformities. These buried soils are fine-textured, ranging from clayey silts and silty clays to sandy silts and silty fine sands, with significant organic matter present in the buried A horizons suggestive of stable surfaces supporting a relatively dense biomass. The surface horizon is a veneer of silty fine sand, apparently is wind-deposited for the most part, and supports the present-day sagebrush shrubland vegetation community.

Flora and Fauna

The Yarmony site is located in a sagebrush-dominated setting surrounded by piñon pine and Rocky Mountain juniper woodlands (Figure 3.3). Commonly observed in the sagebrush community are rabbitbrush, prickly pear, grasses, and forbs; juniper and wild rye are rare, but conspicuous, components of the vegetation at Yarmony. Cottonwoods, willows, and chokecherry grow along major drainages. Higher slopes see the addition of other shrubby species such as snowberry, bitterbrush, squawbush, and serviceberry, along with gradual transitions to montane forests of lodgepole pine, Douglas fir, and aspen. The usual subalpine species Engelmann spruce and subalpine fir, with blue spruce

FIGURE 3.3

View to the north from the House Locus at Yarmony, prior to excavation. The savanna ecozone, dominated by sagebrush and scattered piñon and juniper, is visible in the foreground. The mixed shrub community, including juniper, is visible on the hogback in midground. Cottonwoods, along McPhee Gulch, are seen at the base of the hogback. Piñon-juniper forest and the montane and subalpine ecozones are visible in the distance on the north side of the Colorado River valley and on the slopes of Black Mountain.

and white fir along the drainages, are prominent on the higher peaks surrounding Yarmony, and limited patches of alpine tundra occur on the crest of Piney Ridge. More extensive areas of tundra vegetation are found on the summits of the main Gore Range farther east. Pollen percentages from a surface sample at Yarmony are dominated by pine (a wind-pollinated taxon), sagebrush and juniper, while grasses, spruce, goosefoot, fir, and Douglas fir occur in smaller amounts. See Chapter 9 for a more detailed discussion of the local palynological record, and Mutel and Emerick (1984) for more complete descriptions of Western Slope environmental zones.

Given the altitudinal range represented in the relatively short distances from the Colorado River bottomlands to the surrounding mountains, it is no surprise that the resultant floral diversity provides excellent habitat for an equally varied faunal population. The Yarmony area is reputed to be excellent winter range for mule deer, elk and bighorn sheep. Maps compiled by the Colorado Division of Wildlife illustrate this point quite clearly. During both the survey and excavation phases of the project, mule deer were observed in abundance, and archaeological data from the site confirm that bison also once roamed the area. Antelope are present-day residents in Middle Park, and probably inhabited more open stretches of the Colorado River valley below Gore Canyon in small numbers prehistorically.

Other large mammals include the omnivorous and carnivorous species such as black bears, grizzly bears, wolves, mountain lions, bobcats, and coyotes, but these are usually rare or absent in archaeological assemblages, including at Yarmony. Smaller game, on the other hand, were commonly sought by prehistoric hunter-gatherer groups and are present in abundance in the Yarmony area and surroundings. Among these species are beavers, muskrats, badgers, rabbits, jackrabbits, prairie dogs, ground squirrels, porcupines, woodrats, grouse, and various raptors. The Yarmony faunal assemblage also shows that riparian resources were sought; common native fish of the Colorado River include cutthroat trout, mountain whitefish and suckers, and collecting of freshwater mussels should not be ruled out. Given slightly warmer water, such as may have characterized the Altithermal episode, other fish like the Colorado River squawfish may have been available to Yarmony anglers.

Local Land Use Patterns

In the Yarmony area, the relatively short growing season and generally cool nighttime temperatures do not permit agriculture in most commercial crops. Dispersed patches of river terrace lands and lower elevation hillslopes have been cleared for pasture grasses, beyond which the native vegetation communities are altered only by the increased grazing from ranch stock. The Yarmony site lies in one such patch of grazed shrubland, directly adjacent to a cleared pasture on the west and northwest. Timbering, mining, and other common industries in the mountains are not prominent in the local economy; recreational pursuits like hunting, fishing, and rafting, on the other hand, are very popular locally but leave only ephemeral traces on the landscape. Overall, the impact of modern life has been slight and, thus, the Yarmony environment is less changed from its prehistoric condition than most other major river valleys in western Colorado.

CHAPTER 4

FIELD METHODS

by Anne McKibbin

Introduction

Field excavations at 5EA799, and subsequent lab analyses of data recovered at 5EA799, employed conventional strategies and techniques. Methods used in test and data recovery excavation, and in artifact and sample recovery, are described here. Analytical methods, along with goals and results, are presented in other chapters. Analysis of chipped stone debitage, chipped stone tools, ground stone and bone debris and tools can be found in Chapter 7 (lithic assemblage) and in Chapter 8 (faunal assemblage). Methods employed by outside consultants can be found in Chapter 9. Geomorphological analysis is discussed in Chapter 5.

Test Excavations

Test excavations at 5EA799 were undertaken initially to determine NRHP eligibility and then, having established eligibility, to guide data recovery excavations in both placement and scope. Shovel probes, single 1 m^2 test pits, facing up existing cutbanks, and backhoe trenches were used to determine the presence/absence and nature of buried cultural remains. Initial excavations were discovery-oriented, later testing served to define the extent of cultural deposits.

Eighteen shovel probes were excavated at 5EA799. These were laid out in lines at 5 m spacing. Since shovel probing was the first subsurface examination of the site, placement of the probes focused on areas where deposition was thought or known to be present and where buried cultural material was suspected to exist. These areas were identified from existing cuts and eroding rills, from enhanced vegetation growth, and from topographic relationships. Probes were excavated by hand with all dirt screened. General control over depth was maintained to allow vertical proveniencing of artifacts. Probes averaged 30 to 40 cm in top diameter and were excavated to depths ranging from 10 to 40 cm, averaging 20 to 25 cm, depending on soil conditions.

Excavation of one-square-meter test pits occurred at various locations on the site. Twenty-four such test pits were excavated over the course of fieldwork with several expanded into larger block excavations where findings were significant. Some of these test pits were placed at positive shovel probe locations to further pinpoint the nature, depth, and extent of cultural material. Other test pits were placed in areas where more substantial deposition was suspected or demonstrated. The firs test pits were, like the shovel probes, placed in areas where potential for deposition and cultural material were thought to be greatest. These included areas where cutbanks and eroding areas demonstrated some deposition, in areas where vegetative growth was enhanced and

thus soil depth greater, and in areas where artifacts were found on the surface. Later in the course of excavation, test pits were placed at or near areas where deposition and buried cultural material were known to occur. These areas were identified in backhoe trenches and by other excavations.

With the exception of the initial test pit (Test Pit 1), these excavations were placed within a grid system established on the site. The original site datum (a 10" spike with an aluminum tag bearing the temporary site number 2413) was set in concrete. This point was arbitrarily given the coordinate 150N 100E. From this site datum, baselines were extended to the cardinal directions, with points staked every ten meters over the area of anticipated excavation. Within this grid system, individual excavation units were laid out. Grid coordinates were assigned to each test pit accordingly. Extensions of the grid system were made as necessary. Only the initial test pit from early in 1987 and the cutbank face-ups in the Road Cut Locus are not positioned in the grid system.

Due to an error committed early in excavation, grids are labelled according to the coordinate of their northeast corner, rather than the southwest corner. As an example, grid 150N 100E would include the one-square-meter area between the 149N and 150N lines, and between the 99E and 100E lines.

Excavation proceeded in these units in 5 cm levels, measured below present ground surface. Since the natural stratigraphy of the site lies essentially parallel to present intact ground surface, these arbitrary levels provided adequate control over stratigraphic context. At 5cm, they also provided finer resolution within individual strata than would have been realized if natural stratigraphic levels were followed. A local datum was used at each test pit to provide additional control over the depth of excavation and the depth of recovered artifacts. Excavation continued until stratigraphic Unit 1 was encountered. Unit 1 had been demonstrated to pre-date all known occupations on the site and is in fact Middle Pleistocene in age. Depth of excavation varied from 40 or 50 cmbs to over 1 m.

In several places, existing cutbanks were "faced up" to provide views of profiles and features. Excavation of these units was designed to take advantage of existing cutbanks, especially the roadcuts along Trough Road and the cutbanks along the drainage on the east side of the site. Placement of these units was dictated by the presence of cultural material eroding from cutbanks and the potential for revealing profiles of natural and cultural stratigraphic sequences. Excavations of these units followed the methods used in test pit excavations. These excavations were generally 2 to 3 m long and aligned with the cutbank rather than the grid system.

Backhoe trenches were excavated in the central area of the site. These were used to provide deep and more extensive profiles for examination of site formation processes and to explore for additional larger subsurface features. Four trenches were excavated, covering a total length of 56 m. Depth ranged from about 1 to 1.5 m.

Data Recovery Excavation

Test excavations described above served as a guide for placement of data recovery excavations. Data recovery involved excavation of multi-square meter

"plazas" at locations where testing had demonstrated the presence of significant cultural remains. Four such areas, or loci, exist: the Pit House Locus around Houses 1 and 2; the Ceramic Locus just north of the houses; the Road Cut Locus on the southeast shoulder of the old Trough Road; and the Feature 14 Locus along the incised drainage in the northeast corner of the site. All data recovery excavations were laid out within the grid established on the site during testing.

Data recovery excavations proceeded in 5 cm levels but, unlike the test excavations, were usually done in levels below datum rather than below ground surface. This still allowed for discrimination between natural stratigraphic levels but simplified vertical control in the larger block excavations where ground surface was soon obliterated. Each locus had its own vertical datum (or datums). These were surveyed in relative to the ground surface (concrete surface) at the site datum and can thus be zeroed back to this common point.

Within the house fill, variations in data recovery methodology were employed as conditions and findings warranted. Initially, a portion of House 1 was excavated to near the floor in 5 cm levels measured below datum just as excavations had proceeded elsewhere. Results of these excavations showed that 5 cm levels were not providing any additional resolution over 10 cm levels, due primarily to rodent bioturbation. They also demonstrated the presence of several natural breaks in the stratigraphy of the house fill. Excavation thus continued in 10 cm levels which were initiated and terminated at natural breaks in the stratigraphy.

A "floor contact level" was excavated within House 1. This level began at a point about 5 cm above the floor and was identified by the first appearance of Unit 1 materials (the stratigraphic unit from which the house pit was dug) and by the presence of oxidation and increased charcoal (from burning roof materials). All fill from these floor contact levels was saved for water screening and flotation.

Excavation of features, excluding the two houses, focused on recovery of the feature fill, and separation of the fill into levels if the feature was of sufficient depth. Once a feature had been identified, the contents of the feature were removed as a separate provenience from the surrounding soil. Feature fill was removed in levels within the four storage bins in House 1. In other features, fill was removed as a unit. Samples for flotation, ^{14}C dating, and pollen analysis were removed from several locations in the fill of all features. Especially in the lined storage bins, care was taken to sample the very bottom of the fill. All feature fill which was not collected as a sample was saved for water screening.

Upon completion, all excavations were backfilled. Most excavations were backfilled simply with the fill that was removed and screened. However, the two houses and Feature 14 were backfilled with other material to aid in their re-excavation should further research become possible. House 1 was filled with ca. 10 yd^3 of clean concrete sand (ca. 15 tons). This was placed in the house pit and on the excavated surface around the house. House 2 and the Feature 14 excavations were filled with crushed cinders. All three of these excavations were then returned to grade with the remainder of the excavation's backdirt.

Excavation Records

A variety of records were kept of the excavations to assist in the analysis, document the work and provide materials for presentation of professional papers and local public talks. These include field notes, field illustrations and photographs, all of which are on file at MAC in Eagle, Colorado.

As work proceeded, notes were kept by the excavators. These notes summarized the progress, soils, findings and materials recovered in each level of each grid. Notes on the excavation of House 1 were kept by one person, to provide consistency over the excavation. In addition, the field supervisor kept daily notes, summarizing each day's work and findings.

Field illustrations, including maps and profiles, were kept covering all aspects of the excavations. Scaled profiles of test pits, backhoe trenches, profile facings, and of the two houses were produced. Each feature was profiled. Scaled plan views of all features, of single grids where mappable material was encountered, and of the two houses were made. Sketch maps and profiles were maintained by the field supervisor and by crew chiefs to record the progress and findings, supplementing the daily notes.

Mapping of the floor of House 1 was conducted by restringing the grid lines over the excavation and plumbing the grid corners down to the house floor (Figure 4.1). The map was then drawn, one square meter at a time, showing all floor features. Topography was added to the house floor plan by shooting the elevation of points at every 50 cm across the floor.

The site was mapped with plane table and alidade. Elevations were recorded and a topographic map of the site was produced to which was added the excavations and features.

Photographs were taken of all aspects of the excavations. Both black and white prints and color slides were shot, the former primarily for archival purposes and the latter for presentation. A cherry picker provided by Eagle Telecommunications, Inc., Eagle, Colorado, was used to take overhead shots of House 1 at completion of excavation. Kevin Black took aerial photographs of the site and environs.

A variety of logs were kept. A field specimen log was used to record all recovered material and samples in the field. A photo log kept record of the various photographs taken of the excavations. A list of features was kept by the field supervisor.

Artifact and Sample Recovery

Two methods were used to separate cultural material from matrix. In most excavations, fill was passed through quarter-inch mesh hardware cloth. In the remaining cases, water screening through sixteenth-inch mesh window screen was used to enhance recovery. Quarter-inch screening was conducted in the field as excavation proceeded. All fill excavated at the site, with the exception of the backhoe trenches, was passed through at least quarter-inch screen.

FIGURE 4.1

Work underway in House 1. The excavation grid has been restrung across the house after nearly all excavation has been completed. S. Dominguez (l) and A. McKibbin are plumbing down to reset the grid corners on the floor of the house prior to detailed mapping.

In proveniences where enhanced recovery was desirable, water screening was used. Fill to be water screened came primarily from features and from the floor contact proveniences within House 1. Water screening samples were returned to the lab for processing. Sixteenth-inch window screen was used, washing the soil and very fine particles from the sample using running tap water. All material which failed to go through the screen was air dried. Once dry, the recovered material was sorted by hand in the lab to remove chipped and ground stone artifacts, bone, seeds and charcoal. Remaining material--non-cultural stone, roots, etc.--was discarded.

As artifacts were recovered in the field, and from water screening in the lab, they were sorted into categories of debitage, individual chipped stone tools, ceramics, individual ground stone items, bone debris, individual modified bone items, wood/charcoal samples, and other items. These artifact classes were provenienced to the level within a grid. Where tools, modified bone, ground stone implements, or samples could be point-plotted or given some other more specific provenience, this was done. As they were recovered, each collection of debitage or bone debris from a single provenience and each single ground or chipped stone tool or modified bone artifact was given a discrete field specimen number and entered in the log. These artifacts were then returned to the lab for processing and analysis. Material recovered from water screening was treated similarly.

Samples were taken in the field for a variety of analyses. These included pollen, flotation, wood identification, radiocarbon, and soil samples. Water screening samples have been discussed above.

Pollen samples were taken from most features, from floor contexts in the house pits and as surface control samples. Additionally, a pollen column was taken from a wall in the southeast part of the excavation. Samples were placed in previously unopened self-sealing plastic bags. Soil volumes of ca. 0.25 liters were recovered. Along with soil pollen samples, several ground stone artifacts were recovered for pollen washes. These artifacts were transferred to self-sealing plastic bags immediately upon discovery and were left unopened until analysis. Sue Short, of the Institute of Arctic and Alpine Research, processed and analyzed the soil and pollen wash samples, details of which can be found in Chapter 9.

Flotation samples were taken from feature fill, from floor contexts in the houses, and from other cultural levels where macrobotanical remains were known or suspected. These samples were generally 1 to 2 liters in size and were recovered from specific locations. Sampling focused on the bottom levels of features, especially the storage bins, where macrobotanical remains are expected to accumulate. Samples were collected and stored in brown paper bags prior to processing. Flotation samples were sent to Margaret A. Van Ness in Golden, Colorado. Processing techniques and analysis are outlined in Chapter 9.

Charcoal was recovered in numerous locations in the Yarmony House excavations, both as excavation proceeded and from water screen and floatation samples. Charcoal was removed, cleaned of most of the matrix, and bagged in foil pouches for storage until processing. Attempts were made to limit the provenience of each sample to as discrete an area as possible while collecting enough material for processing. Special attention was paid to collection of

charcoal from house roof fall and from features within the house. Charcoal samples were submitted to Beta Analytic of Coral Gables, Florida, for analysis.

Several samples of burned wood were collected for species identification. These were recovered in the field and carefully wrapped to protect their integrity until analysis. Wood samples were sent to Dr. Craig Schuler at the Wood Sciences Laboratory at Colorado State University. Details of his analysis are found in Chapter 9.

Samples of soil were collected in several locations to provide stratigraphic description and correlation of natural soil units across the site. These were collected to supplement on-site work by Richard Madole of the US Geological Survey, who conducted the geomorphological research and analysis of the site. These samples were generally ca. 1 liter in size and collected from stratigraphic columns and other locations where the need to place the location within the site's stratigraphy was present. Details of this analysis are found in Chapter 5.

CHAPTER 5

QUATERNARY GEOLOGY AND GEOMORPHOLOGY

by Richard F. Madole

Introduction

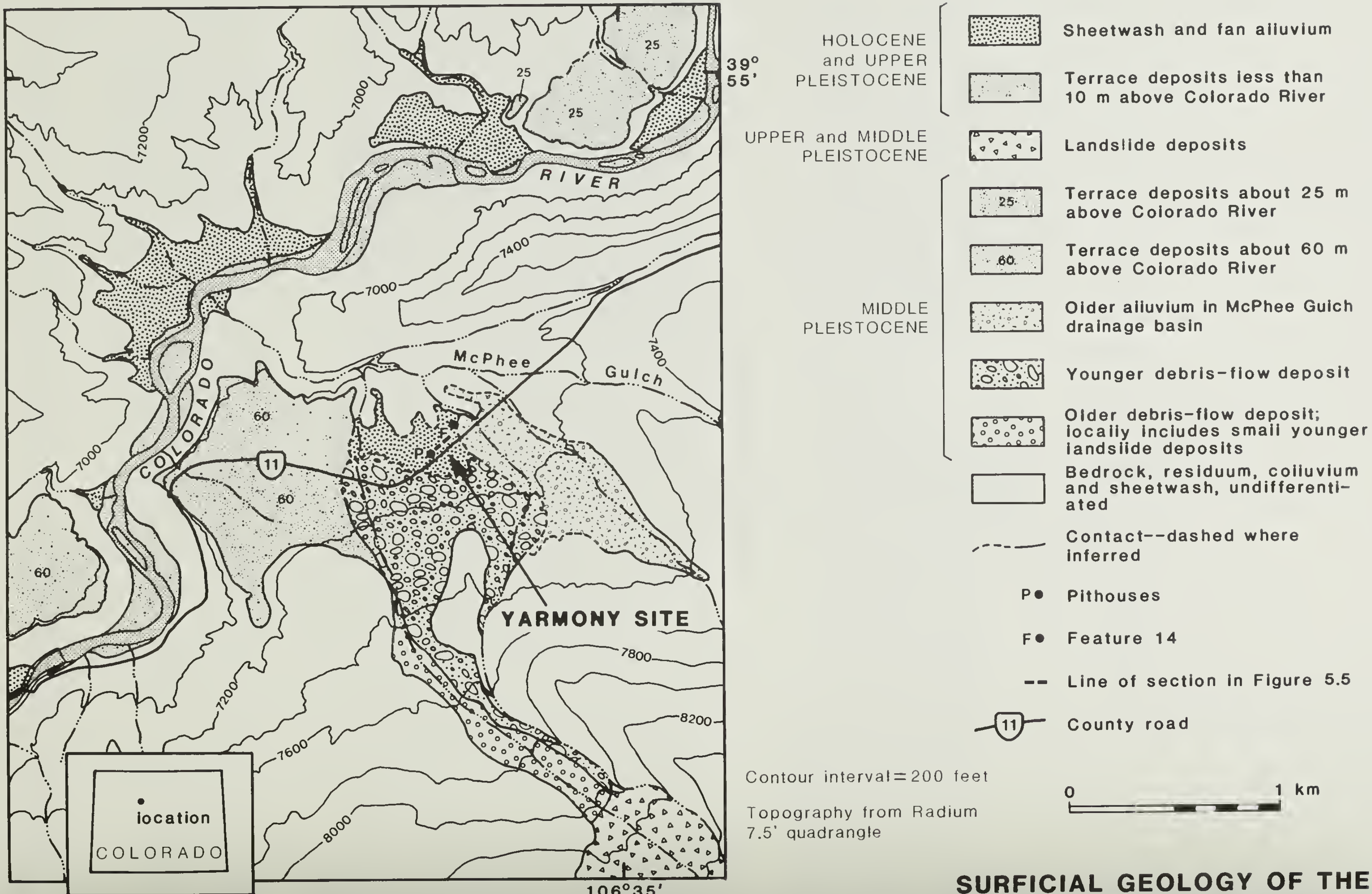
The Quaternary geology and geomorphology of the Yarmony site (5EA799) were studied to determine the age and origin of the stratigraphic units present and to obtain information about paleoenvironment. Fieldwork focused mainly on the Quaternary stratigraphy exposed in archeological excavation units, but stratigraphic data also were collected in a few cutbank exposures along McPhee Gulch and tributary arroyos (Figure 5.1). Geomorphic data were collected by means of traverses across the drainage basin of McPhee Gulch and study of 1:24,000-scale aerial photographs.

Geomorphic Setting

The Yarmony site is in a small drainage basin that was graded to an ancestral valley floor of the Colorado River. The ancestral valley floor was abandoned, probably in the early part of middle Pleistocene time (Table 5.1), when the Colorado River entrenched its channel and formed a narrow inner valley. The floor of the inner valley is typically 150 to 400 m wide and about 60 m below the pre-entrenchment valley floor (Figure 5.2). In places, remnants of the pre-entrenchment valley floor are relatively extensive. The Yarmony site is on post-entrenchment deposits that overlap and partly obscure the confluence of the pre-entrenchment Colorado River valley and the small tributary drainage basin, now incised by McPhee Gulch and other unnamed arroyos (Figure 5.1). Small tributaries to the ancestral Colorado River were unable to keep pace with entrenchment of the Colorado River; hence, basins like that of McPhee Gulch more or less became hanging valleys drained by inconspicuous, ephemeral streams. Most remnants of the ancestral valley floor are overlapped by wedges of colluvium and alluvium that thin and slope from the valley sides toward the valley center. Fluvial gravel, buried by colluvium and valley-side alluvium, underlies the broad surface just west of the Yarmony site.

The course of the upper Colorado River valley was established about 10 million years ago when late Miocene block faulting (Table 5.2) elevated the region (Larson *et al.* 1975). Valley deepening during late Miocene and Pliocene time is estimated to have been about 900 to 1000 m, and during Quaternary time was 300 m or less, depending on location (Hunt 1969; Larson *et al.* 1975). The entrenchment that formed the inner valley probably began during middle Pleistocene time (790-130 ka)[1]. In this region, lower Pleistocene stream-terrace

[1]ka-kilo annum or thousand years (North American Commission on Stratigraphic Nomenclature 1983).



SURFICIAL GEOLOGY OF THE YARMONY SITE AND VICINITY

FIGURE 5.1

Table 5.1

Quaternary Time Chart

FORMAL TIME DIVISIONS		INFORMAL TIME TERMS			AGE[1] (ka)
Quaternary Period	Holocene Epoch				
					10
	Pleistocene Epoch	late Pleistocene		Pinedale glaciation	
					30
					130
		middle Pleistocene	late	Bull Lake glaciation	
					300
			middle	pre-Bull Lake glaciation	
					620
			early		
					790
		early Pleistocene			
					1650

[1]See Richmond and Fullerton (1986) and Morrison (in press) for the bases for age imits of the Pleistocene and its subdivisions.

FIGURE 5.2

View looking southwest (downstream) of the Colorado River valley. Miocene basalt extruded between 24 and 20 Ma (Larson and others 1975) caps part of the landscape and dips toward the axis of the State Bridge syncline, which formed in late Miocene time after the basalt was extruded. Remnants of a former valley floor (foreground and middle distance) are relatively common about 60 m above the entrenched inner valley of the Colorado River (Photo by J. R. Stacy).

Table 5.2

Geologic time chart and principle geologic events in the Yarmony area and adjoining region

GEOLOGIC TIME CHART
USGS, 1986

EON	ERA	PERIOD		EPOCH	BOUNDARY AGE: Ma
Phanerozoic	Cenozoic	Quaternary		Holocene	0.01
				Pleistocene	1.65
		Tertiary	Neogene subperiod	Pilocene	5
				Miocene	23
			Paleogene subperiod	Oligocene	36
				Eocene	57
				Paleocene	66
	Mesozoic	Cretaceous		Late Early	96 138
		Jurassic		Late Middle Early	205
		Triassic		Late Middle Early	250
	Paleozoic	Permian		Late Early	290
		Pennsylvanian		Late Middle Early	~330
		Mississippian		Late Early	355
		Devonian		Late Middle Early	405
		Silurian		Late Middle Early	435
		Ordovician		Late Middle Early	510
		Cambrian		Late Middle Early	~570[1]
Proterozoic	Late Proterozoic				900
	Middle Proterozoic				1600
	Early Proterozoic				2500
Archean	Late Archean				3000
	Middle Archean				3400
	Early Archean				3800?
pre-Archean[2]					4550

PRINCIPAL EVENTS IN THE YARMONY AREA AND ADJOINING REGION

Epoch	Ma	Events
Quaternary	1.65	Time of cooler climate, repeated glaciation, and episodic aggradation along rivers.
Pilocene	5	Renewed uplift; major canyon cutting and denudation. Upper Colorado River deepens valley 900-1000 m during late Miocene and Pliocene.
Miocene	10	Colorado River established on terrain of low relief (Hunt 1969; Larson and others 1975).
		Uplift and block faulting in Miocene and Pliocene time raise and fragment late Eocene erosion surface. Uplift ranged from 1500 to 3000 m.
	23	Browns Park Formation deposited west flank of Gore Range about 24 to 10 Ma and Troublesome Formation east of Gore Range about 27 to 11 Ma (Izett 1975).
Oligocene		Basaltic lavas extruded between 24 and 20 Ma east flank of White River Plateau and west flank of Gore Range, including Piney Ridge and State Bridge areas (Larson and others 1975).
	36	Thirtynine Mile volcanic field buries large part of Eocene erosion surface west of southern Front Range, 36-33 Ma (Epis and Chapin 1975).
Eocene		Regional stability; development of extensive erosion surface. Fauna in Florissant Lakebeds (Oligocene) indicate region eventually reduced in elevation to about 900 m (MacGinitie 1953).
	45	Laramide orogeny ended by this time.
	57	From Late Cretaceous to early Eocene time, sediments eroded from rising mountains are deposited in basins formed adjacent to uplifts.
Paleocene	66	
	70	Laramide orogeny begins in Front Range-Park-Gore Range area (Tweto 1975).
Late Cretaceous	96	Depositon of about 170 m of Niobrara Formation followed by about 1700 m of Pierre Shale (Tweto and others 1978) in a vast sea that covered the entire state during Late Cretaceous time.

[1]Rocks older than 570 Ma also called Precambrian, a time term without specific rank.

[2]Informal time term without specific rank.

deposits are sparse (Madole in press a and b), but terrace deposits of middle Pleistocene age and younger are common and relatively extensive. Fluvial deposits of late Pleistocene age (130-10 ka) generally are within 10 m of present streams.

The Quaternary deposits at the Yarmony site reflect the influence of geomorphic setting and the processes that transported sediment to the site. The dominant sediment-transport processes within the area are various types of mass movement, chiefly landslides, earthflows, and debris flows. Landslides and earthflows are particularly common where slopes underlain by shale are steep. Consequently, the sides of the entrenched inner valley of the Colorado River and the oversteepened slopes developed where basaltic lava flows overlie shale have been especially susceptible to slope failure. The second most important sediment-transport process in the area is sheetwash. The Yarmony site is on a debris-flow deposit (Figure 5.1) that is veneered by 1 m or less of mainly sheetwash alluvium. The debris-flow deposit is of Pleistocene age, whereas the overlying alluvium is Holocene. The debris flow originated at the head of a gulch about 3 km south of and 500 m above the site.

Pre-Quaternary Stratigraphy

Quaternary deposits at the Yarmony site overlie Niobrara Formation (Upper Cretaceous), but were derived mainly from Pierre Shale (Upper Cretaceous) and basaltic lava flows (Miocene) from higher terrain south of the site. The contact between the Niobrara Formation, which is mainly calcareous shale and marly limestone, and the Pierre Shale is 200 to 300 m south of the Yarmony site (Figure 5.3). The Pierre Shale extends over a relatively large area between the Precambrian core of the Gore Range and the State Bridge syncline. Over much of the east limb of the State Bridge syncline, the Pierre Shale is unconformably overlain by basaltic lava flows, as much as 330 m thick, that were extruded between 24 and 20 Ma[2] (Larson *et al.* 1975). Uplift in late Miocene time (Table 5.2) deformed the flows and formed the State Bridge syncline (Figures 5.2, 5.3). Piney Ridge, a few kilometers south of and 700 m above the Yarmony site, is capped by Miocene basalt and is a source of basalt clasts at the site.

The Pierre Shale is in fault contact with Precambrian igneous and metamorphic rocks that form the core of the Gore Range and is also in fault contact with small remnants of Paleozoic and Mesozoic rocks overlying the Precambrian core (Figure 5.3). Paleozoic and Mesozoic rocks underlie the Pierre Shale west of the Gore Range, and crop out along the entrenched inner valley of the Colorado River north of the Yarmony site and along the flank of the Gore Range farther south (Tweto *et al.* 1978).

Sedimentary rocks of the Miocene Browns Park Formation are the youngest pre-Quaternary rocks in the area. They are not present at the Yarmony site, but crop out along the axis of the State Bridge syncline about 5 km west of the site, and on uplands near Sheephorn Creek about 7 km east of the site (Figure 5.3). The strata in both areas belong to the upper part of the Browns Park Formation (Larson *et al.* 1975), and probably were deposited between 14 and 10

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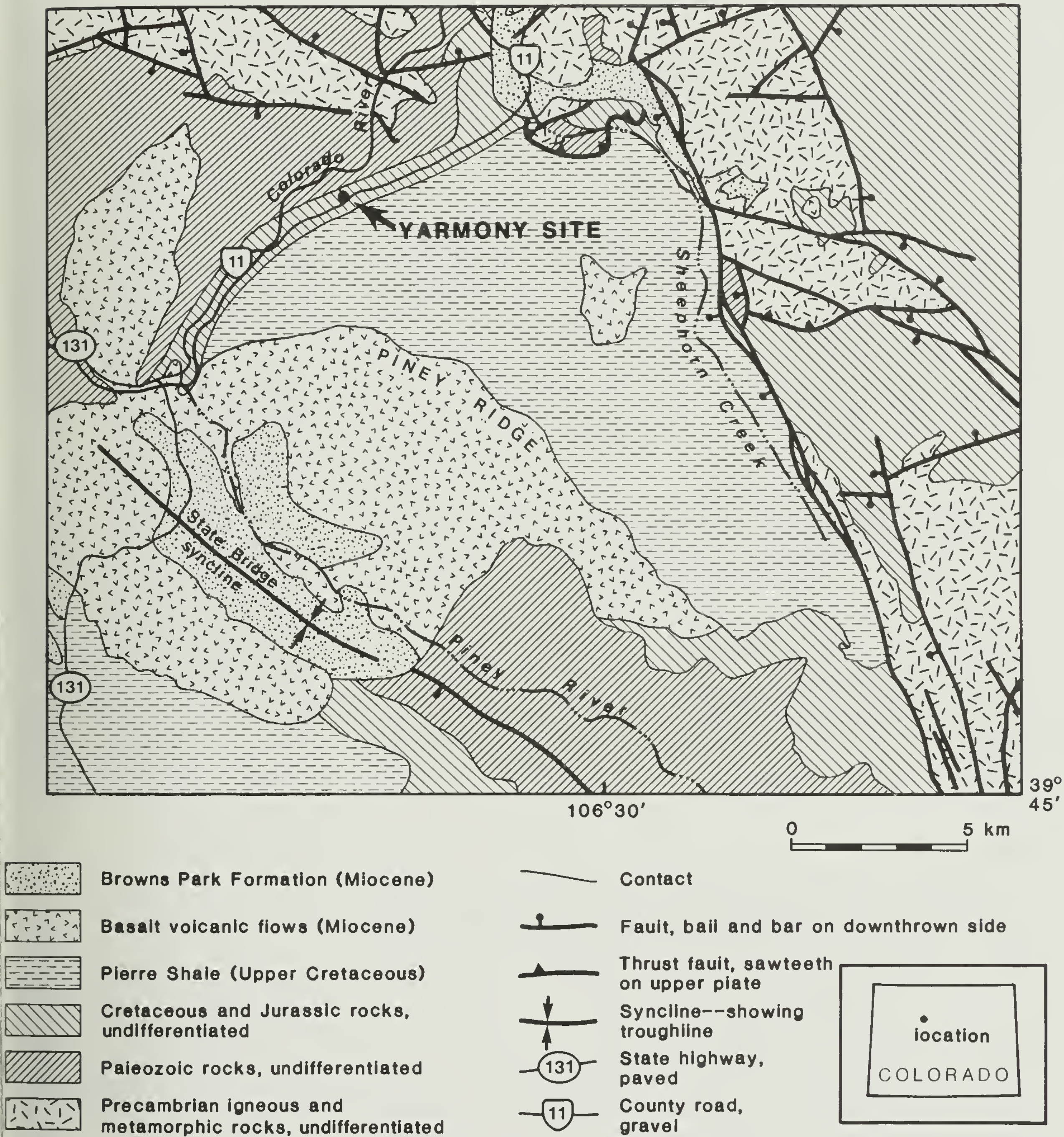
[2]Ma=mega-annum or 10^6 years (North American Commission on Stratigraphic Nomenclature 1983).



Geologic map of the Yarmony area (after Tweto and others 1978). Small areas of volcanic rock are omitted, except for places in the Gore Range where their presence and that of the Browns Park Formation show that uplift of the range displaced these rocks and, therefore, postdates them. Also, small areas of Paleozoic rocks are omitted or combined with Jurassic and Cretaceous rocks where they overlie the Precambrian core of the Gore Range. As in other parts of the region, deposition of Browns Park sediments alternated with extrusion of lava; hence, Browns Park Formation overlies volcanic rock in the State Bridge syncline and is overlain by volcanic rock near Sheephorn Creek.

YARMONY AREA GEOLOGIC MAP

FIGURE 5.3

Ma. Generally, along the west flank of the Park and Gore Ranges, the Browns Park Formation was deposited between about 24 and 10 Ma (Izett 1975). The Browns Park Formation predates the inception of the Colorado River in this area (Hunt 1969; Larson *et al.* 1975).

Quaternary Stratigraphy

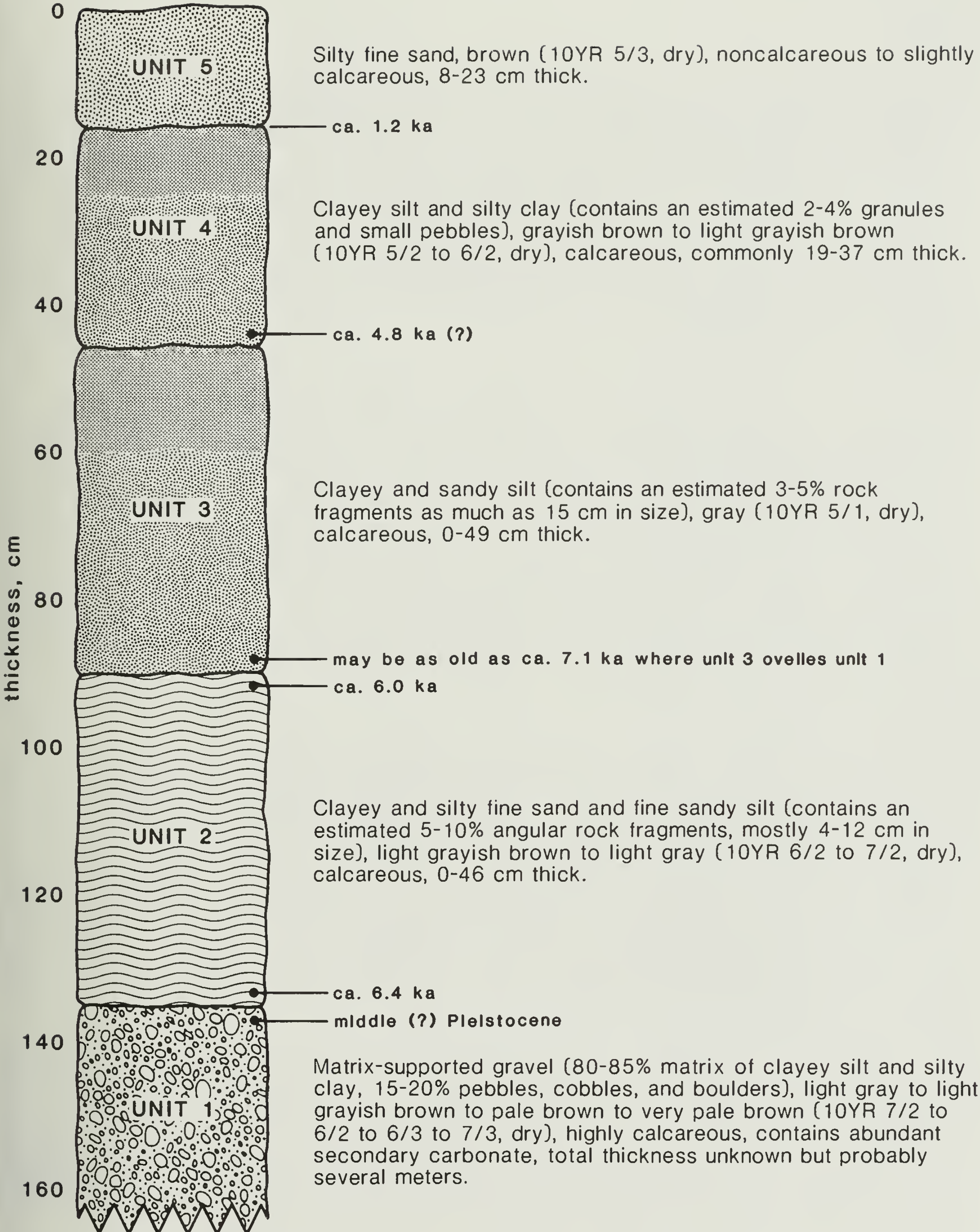
Five stratigraphic units of Quaternary age are recognized at the Yarmony site (Figure 5.4), including a diamicton (unit 1), a localized deposit that is probably cultural (unit 2), and three units that form a thin cover (26-92 cm) of Holocene alluvium. The alluvial units have smoothed the irregular surface of the underlying debris-flow deposit by filling in swales and rills, which explains the variation in thickness and limited lateral extent of these units. The thicker sections of alluvium probably are filled paleochannels.

The five stratigraphic units at the Yarmony site are differentiated by differences in color, texture, and evidence of unconformities. In most places, stratification, which is manifested chiefly by changes in color and/or grain size, is not recognizable in these units. Stratification either never developed or developed but was subsequently destroyed. Given the lack of vertical variation in texture within individual units, stratification probably never formed and sediment transport and deposition probably were chiefly by sheetwash. Alluvium deposited by channelized flow tends to be stratified because runoff and differences in erosion and transport of sediment vary from one rainstorm or snowmelt to the next. Beds of coarse-grained sediment deposited by high stream discharges alternate with fine-grained beds deposited by low discharges. Alternating beds of different texture were not observed at the Yarmony site, and, with the exception of unit 1, the textural differences between units are small.

Unit 1

Unit 1 is a diamicton of probable debris-flow origin (Figures 5.1, 5.4) that contains boulders and cobbles of Miocene basalt, like the basalt capping Piney Ridge to the south. Boulders and large cobbles are rare in the other units, except locally, and where present, were derived from unit 1. The surface of unit 1 is uneven partly because it originated by mass movement and partly because it is an erosional unconformity. Abundant secondary carbonate in the upper part of unit 1 appears to be the remains of a K horizon (Gile *et al.* 1966) that was largely eroded, along with an overlying B horizon, prior to deposition of the other units. Remnants of a K horizon suggest that unit 1 probably is at least late middle Pleistocene (300-130 ka) in age.

It is not known when the soil in the upper part of unit 1 was eroded, although a ^{14}C age of 7050 ± 200 B.P. (Beta-25078) of disseminated charcoal from alluvium just above unit 1 a few tens of meters south of County Road 11 (Figure 5.1) implies erosion was prior to 7 ka. Four additional ^{14}C ages (6330 ± 110 B.P., Beta-25075; 6320 ± 90 B.P., Beta-21197; 6290 ± 150 B.P., Beta-23788; 6290 ± 70 B.P., Beta-25077) of disseminated charcoal from at or slightly above the contact between units 1 and 2 in the vicinity of the Yarmony pit houses provide more conclusive evidence that most, if not all, stripping had occurred prior to about 6.4 ka.



Columnar section of Quaternary units present in the vicinity of the Yarmony pithouses. Column shows typical unit thicknesses; text lists range in thickness. Grain sizes listed are according to the Wentworth scale.

YARMONY SITE STRATIGRAPHIC SECTION

FIGURE 5.4

Part of the relict soil in unit 1 may have been stripped during Pinedale time and some stripping apparently occurred in Holocene time. A sequence of alluvial-fan deposits at the confluence of McPhee Gulch and the Colorado River, about 1.3 km northwest of the Yarmony site (Figure 5.1), records at least three episodes of aggradation, each of which is assumed to correspond to a time of erosion and channel incision on nearby uplands. Deposition of the oldest fan alluvium is interpreted to be nearly coeval with a terrace gravel of late Pinedale age, and the youngest fan alluvium is historic; it presently is prograding into the channel of the Colorado River from the mouths of incised arroyos. The intermediate fan alluvium is Holocene and may include deposits of more than one age.

Unit 2

Unit 2 was observed only within a few meters of the pit houses and is probably of cultural origin. Besides being of limited extent, the unit is characterized by abundant charcoal, ill-defined contacts, and colors that suggest it is a mixture of materials. Four ^{14}C ages of disseminated charcoal from within or adjacent to the pit houses show that unit 2 accumulated between about 6.4 ka and 6.0 ka. The ^{14}C ages from within the pit houses are 6290 ± 70 B.P.(Beta-25077) from the floor of the eastern pit house (lowermost unit 2), 6290 ± 150 B.P. (Beta-23788) from a similar stratigraphic position in the western pit house, and 6030 ± 100 B.P. (Beta-25076) from the top of unit 2 at the center of the eastern pit house. Adjacent to the western pit house, charcoal from the contact between units 1 and 2 provided a ^{14}C age of 6320 ± 90 B.P. (Beta-21197).

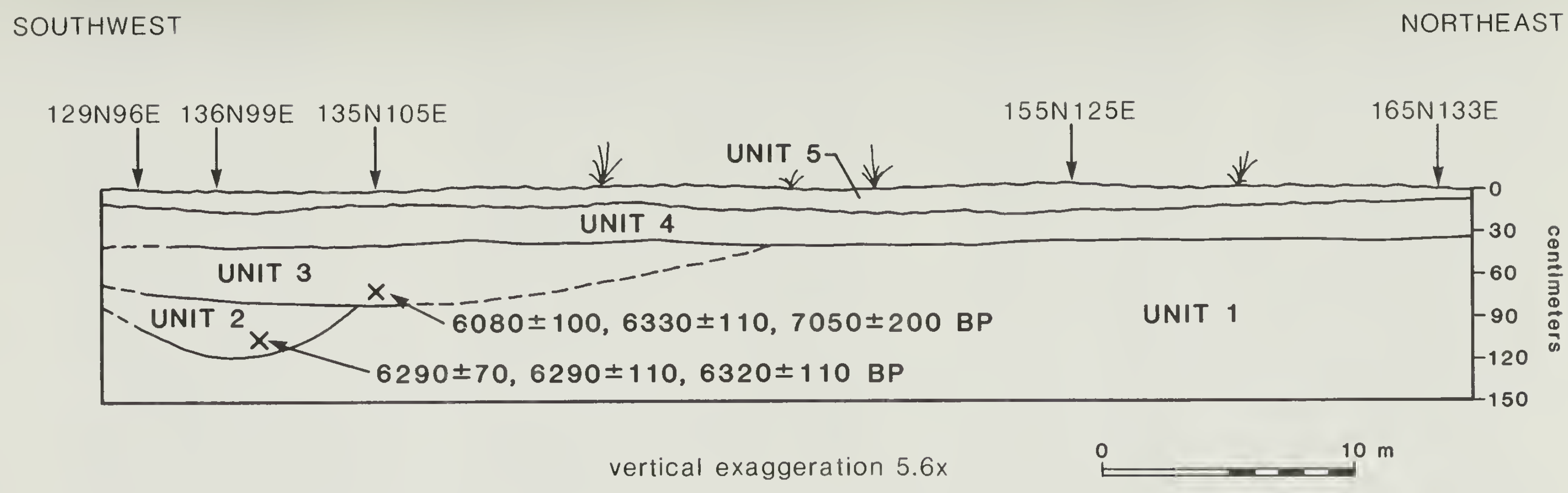
Unit 3

Unit 3 is alluvium that filled a shallow paleochannel (Figure 5.5). It is similar to unit 4 except that it is gray rather than light-grayish brown and is slightly less clayey (Figure 5.4). A weakly developed soil consisting of a simple A/C profile delineates the top of unit 3. The A horizon ranges in thickness from 8 to 20 cm and is only slightly darker than the C horizon. The color of the C horizon resembles the gray to bluish gray of hydromorphic soil commonly found around and downslope from springs. Its color and the presence of abundant fossil gastropods in places suggest that unit 3 may have accumulated in a water-saturated environment. This environment may have been similar to the water-saturated reaches presently found in places on the floor of McPhee Gulch and its tributaries north of the Yarmony site.

Unit 3 is estimated to have been deposited mainly between 6.0 and 4.8 ka; however, neither age limit is accurately dated. The beginning of deposition is inferred from ^{14}C ages obtained for unit 2 discussed above, and the end of deposition is limited by a ^{14}C age from unit 4. Unit 3 may have begun to accumulate earlier than 6 ka, possibly as early as 7050 ± 200 B.P. (Beta-25078), the ^{14}C age of the charcoal mentioned above that was collected from the basal part of sediment overlying unit 1 several tens of meters upslope from the Yarmony site.

Unit 4

Unit 4 is chiefly sheetwash alluvium that blankets the area around the pit houses (Figure 5.5). The unit is similar to unit 3, but is grayish brown rather



Cross-section showing Quaternary stratigraphic units at the Yarmony site and approximate stratigraphic position of two sets of radiocarbon ages of charcoal. The two sets of ages are from within the area of the pithouses (unit 2) and from just above the unconformity on unit 1. The 7050±200 BP age was from an excavation unit on the south side of the road opposite the pithouses; the other two ages in the set were from near the pithouses. Archaeological grid numbers above cross-section identify corners of excavation units crossed by the line of the section.

QUATERNARY STRATIGRAPHY AT YARMONY

FIGURE 5.5

than gray and seems slightly more clayey. Unconformities also bound unit 4 above and below. The unconformity at the top of unit 4 is delineated by a buried soil that contains shallow paleocracks filled with unit 5 and by small fragments of unit 4 in the basal part of unit 5. The buried soil in the top of unit 4 consists of a weakly developed A/C profile, in which the A horizon is only slightly darker (10YR 5/2, dry) than the C horizon (10YR 6/2, dry). The A horizon ranges in thickness from 8 to 11 cm and has what appears to be better developed structure (moderate blocky subangular) than the soil in unit 3. The difference in structure is attributed to the more clayey texture of unit 2 rather than to differences in duration of soil formation.

The age of unit 4 is estimated mainly from ^{14}C ages in adjacent units. Most of unit 4 probably was deposited after 4.8 ka and before 1.2 ka. The basal part of unit 4 may be as old as or older than 4790 ± 70 B.P. (Beta-28131), the age of disseminated charcoal from a depth of 40 cm at archaeological feature 14 on the east side of a small arroyo about 120 m northeast of the pit houses. The charcoal was from near the bottom of a bed that is correlated with unit 4 on the basis of color, texture, and position beneath unit 5. The uppermost part of unit 4 is older than 1230 ± 60 B.P., the age of fine charcoal and charcoal stain at or just below the contact with unit 5.

Unit 5

Unit 5 differs notably in color, texture, and $CaCO_3$ content from the other units (Figure 5.4). It is brown and uniformly sandy, contains little material larger than 2 mm, and is noncalcareous to slightly calcareous over much of the area. Unit 5 blankets the Yarmony site; its presence on both knolls and swales and its relatively uniform texture and color suggest that, in addition to sheetwash, eolian processes may have played a part in its origin.

In places, a very weakly developed soil is present in unit 5, but, over much of the site, the soil has apparently been eroded or is difficult to discern because of a dense network of grass roots that is almost as thick (2-3 cm) as the soil. Where present, the soil consists of an A horizon that is as much as 4 cm thick and slightly more gray than the brown parent material. The ^{14}C age from the top of unit 4 shows that unit 5 was deposited after 1230 ± 60 B.P. The general lack of soil development in unit 5 implies that it may have been deposited much later than 1.2 ka.

Geologic History

The geologic history of the Yarmony site is discussed in two parts. The first part briefly summarizes pre-Holocene history and the evolution of the landscape, and the second part focuses on Holocene history and probable changes in climate and vegetation. The landscape viewed by the occupants of the Yarmony site was shaped almost entirely in pre-Holocene time. Except for differences in minor erosional and depositional landforms, such as arroyos and small alluvial fans at the mouths of minor tributaries like McPhee Gulch, the inhabitants saw the land much as we see it today. However, the vegetation and climate at the Yarmony site during the time that the pit houses were occupied were probably somewhat different than today.

Pre-Holocene History

Most ranges of the Southern Rocky Mountains, of which the Gore Range is a part, are elongate north-south trending anticlinal uplifts separated by intermontane basins. Although the configuration of these uplifts was established during the Laramide orogeny, most of the relief seen today is due to major block faulting and uplift, mainly in late Miocene and Pliocene time. The late Cenozoic block faulting and uplift followed a long interval of stability during which the high relief produced by the Laramide orogeny was greatly reduced and an erosion surface was cut over broad areas (Table 5.2). Remnants of this erosion surface are preserved on the Precambrian rocks in the cores of the major uplifts, particularly the northern Gore Range and the Front Range farther east (Bradley 1987). The Precambrian cores of the individual ranges of the Southern Rockies were exposed by erosion long before the Laramide orogeny had ended because the cover of Paleozoic and Mesozoic sedimentary rocks was relatively thin in this region.

Uplift and fragmentation of the post-Laramide erosion surface began in late Oligocene time and continued into Pliocene time (Table 5.2). Uplift was accompanied by widespread volcanic activity, mainly in Miocene time, notably in areas in and adjacent to the San Juan Mountains, Grand Mesa, Elk Mountains, White River Plateau, and parts of the Gore, Park, and Sawatch Ranges. The Yarmony site is between the White River Plateau and the Gore Range in a region once covered by Miocene lava flows. As the late Cenozoic uplift proceeded, sediment eroded from the rising ranges was deposited in adjoining basins, and, in places, was interbedded with lava flows. It was during this time that sediment of the Browns Park Formation was deposited west of the Gore Range and correlative sediment of the Troublesome Formation was deposited east of the range. In late Miocene time, uplift accelerated, and Miocene rocks deposited during earlier uplift were displaced by as much as 600 m (Buffler 1967; Tweto 1980). This uplift caused major canyon cutting and denudation in the uplands and excavation of the less resistant Miocene rocks in adjoining basins. During basin excavation, streams that had established courses on Miocene sediments were let down in many places onto older structures composed of more resistant rocks. Superposition of streams onto buried pre-Cenozoic rocks and structures led to the formation of canyons in many places in the Middle and Southern Rocky Mountains, including the canyon of the Colorado River through the Gore Range (Figure 5.6).

The regional uplift of late Miocene and Pliocene time set the stage for the evolution of the landscape seen today. Regional uplift fragmented and displaced the post-Laramide erosion surface, initiated an interval of progressive valley deepening that continues today, and raised ranges and plateaus high enough to be glaciated. For much of the 10 million years since the course of the upper Colorado River was first established, the river has been downcutting; erosion has dominated and no deposits of latest Miocene or Pliocene age are recognized in north-central Colorado. During Quaternary time, however, valley deepening was periodically interrupted by intervals of aggradation in response to increased sediment supply, probably during glaciations. These intervals of aggradation are recorded by alluvial terraces and related deposits of fan alluvium and colluvium along valley sides.

FIGURE 5.6

View looking northeast (upvalley) of the canyon cut by the Colorado River through the uplifted Precambrian core of the Gore Range. Uplift in late Miocene time proceeded slowly enough, probably in a series of small movements, that the river was able to adjust by downcutting rather than diversion (Photo by J. R. Stacy).

No lower Pleistocene deposits were observed in the vicinity of the Yarmony site, but fluvial gravel judged to be middle Pleistocene (620-300 ka, Table 5.1) underlies the surface west of the site (Figure 5.1). The age assigned to this gravel is based on (1) the height of the gravel about 60 m above the river, (2) the strong soil development (as defined by Birkeland 1984) in the overlying colluvium and alluvium, and (3) correlation with a better dated sequence of terrace deposits in the Yampa River basin to the north (Madole, in press, a and b). By the onset of Pinedale glaciation, about 30 ka (Madole 1986a), the Colorado River had cut to nearly its present level. Deposits of sand and gravel aggraded on the valley floor and were subsequently left as a low terrace (Figure 5.1) when valley incision resumed in Holocene time. Deposits of the low terrace are considered to be late Pleistocene age because they contain a soil profile that consists of A/Bw/C horizons. The soils observed in Holocene deposits in this area have only A/C profiles. The cobble gravel underlying the low terrace probably was deposited near the end of Pinedale time, about 12 ka (Madole 1980, 1986a).

At least twice during Pleistocene time, large debris flows moved down gulches on the northeast flank of Piney Ridge and terminated in the vicinity of the Yarmony site. Two ages of debris-flow deposits are recognized (Figure 5.1) on the basis of cross-cutting stratigraphic relations and differences in surface roughness. The older debris-flow deposit is at least as old as middle Pleistocene and the younger deposit is probably also middle Pleistocene (Table 5.1). The surface topography of the younger deposit is as rough and unmodified as some upper Pleistocene debris-flow deposits, but remnants of a K horizon (Gile *et al.* 1966) in unit 1 suggest a probable middle Pleistocene age.

The debris flows originated at the head of a gulch about 500 m higher than and 3 km to the south of the Yarmony site. The debris-flow deposits abut against landslide deposits in an ill-defined recess on the flank of Piney Ridge. The contact between the landslide and debris-flow deposits is not exposed. The size and volume of the debris-flow deposits and the location of their source suggest that they may have originated during glacial times when hollows on Piney Ridge were filled with snowfields. Meltwater from these snowfields, perhaps in combination with rainstorms, could have mobilized large quantities of debris. It is difficult to visualize individual thunderstorms mobilizing the volume of sediment present in these debris-flow deposits.

Piney Ridge trends northwest-southeast for about 12 km at elevations between 3400 m and 3500 m. The trend and altitude of the ridge were sufficient to sustain periglacial activity, including formation of rock glaciers, and minor glaciation on its northeast side during Pleistocene time. Also, mass movement was widespread during this time, especially on the northeast flank of Piney Ridge. The hollow that was the source of the debris flows at the Yarmony site is 4 km from the high point on the northwest end of Piney Ridge and near the lower limit of late Pleistocene periglacial activity and the zone of extensive mass movement.

Holocene History

The Holocene stratigraphic record in the vicinity of the Yarmony site is limited to thin (generally less than 1 m) accumulations of mainly sheetwash alluvium, in swales, rills, and areas flanking steep slopes. Beyond the limits

of the site, small bodies of fan alluvium were deposited by small tributaries, such as McPhee Gulch, where they enter the Colorado River. The ages and origins of deposits such as these provide the framework for reconstructing local geologic history. However, because Holocene stratigraphic records at most sites generally are incomplete, and the Yarmony site is no exception, reconstruction of Holocene history requires integrating data from as many sources and sites elsewhere in the region as possible.

Paleoclimate generally is reconstructed from biotic and abiotic proxy data. Pollen profiles and shifts in ecotone boundaries are examples of biotic proxy data, and changes in snowline elevation and lake levels are examples of abiotic data. Stratigraphic sequences may provide a physical record of response to change, but they do not necessarily provide evidence of the causes of change and rarely include direct evidence of paleotemperature and paleoprecipitation. The causes controlling the changes recorded in stratigraphic successions may be local or regional. Changes that are regional in kind or timing are generally attributed to climatic change.

Pollen data are more abundant and widely distributed than the other kinds of proxy data. Therefore, it is tempting to interpret paleoenvironmental changes at the Yarmony site from a synthesis of the literature on Holocene vegetational history of montane Colorado. Unfortunately, the Holocene vegetational history of Colorado is relatively unsettled in spite of several published pollen records (Baker 1983). Part of the problem is that some of the Colorado pollen records were obtained at sites far from ecotones (transition zones between ecosystems) or sites that are otherwise ecologically insensitive (Baker 1983). In addition, I believe that insufficient and/or inaccurate age control contribute to the unsettled nature of the Holocene vegetational history. In many places, fewer than three ^{14}C assays provide the age control for pollen profiles. Consequently, dates of vegetational change commonly are estimated by interpolating between ^{14}C ages, which requires that assumptions be made about rates of sedimentation. In addition, much of ^{14}C-age control is from peat and organic-rich pond or lake sediment, deposits that have a high potential for yielding inaccurate ^{14}C ages. Comparison of pollen profiles of different sites is further complicated by site-specific constraints such as elevation, length of section preserved, and stratigraphic position of ^{14}C-datable materials. The stratigraphic position of the ^{14}C age and limits of the section at a given site may or may not coincide with the times of climatic or vegetational change. Also, estimates of shifts in the elevation of timberlines or ecotones are constrained by study-site elevation. Many sites may provide only minimum values because they are not located exactly at the elevation reached by the vegetational change. Given these limitations, perhaps it should not be surprising that published interpretations of Holocene vegetational history and paleoclimate are contradictory.

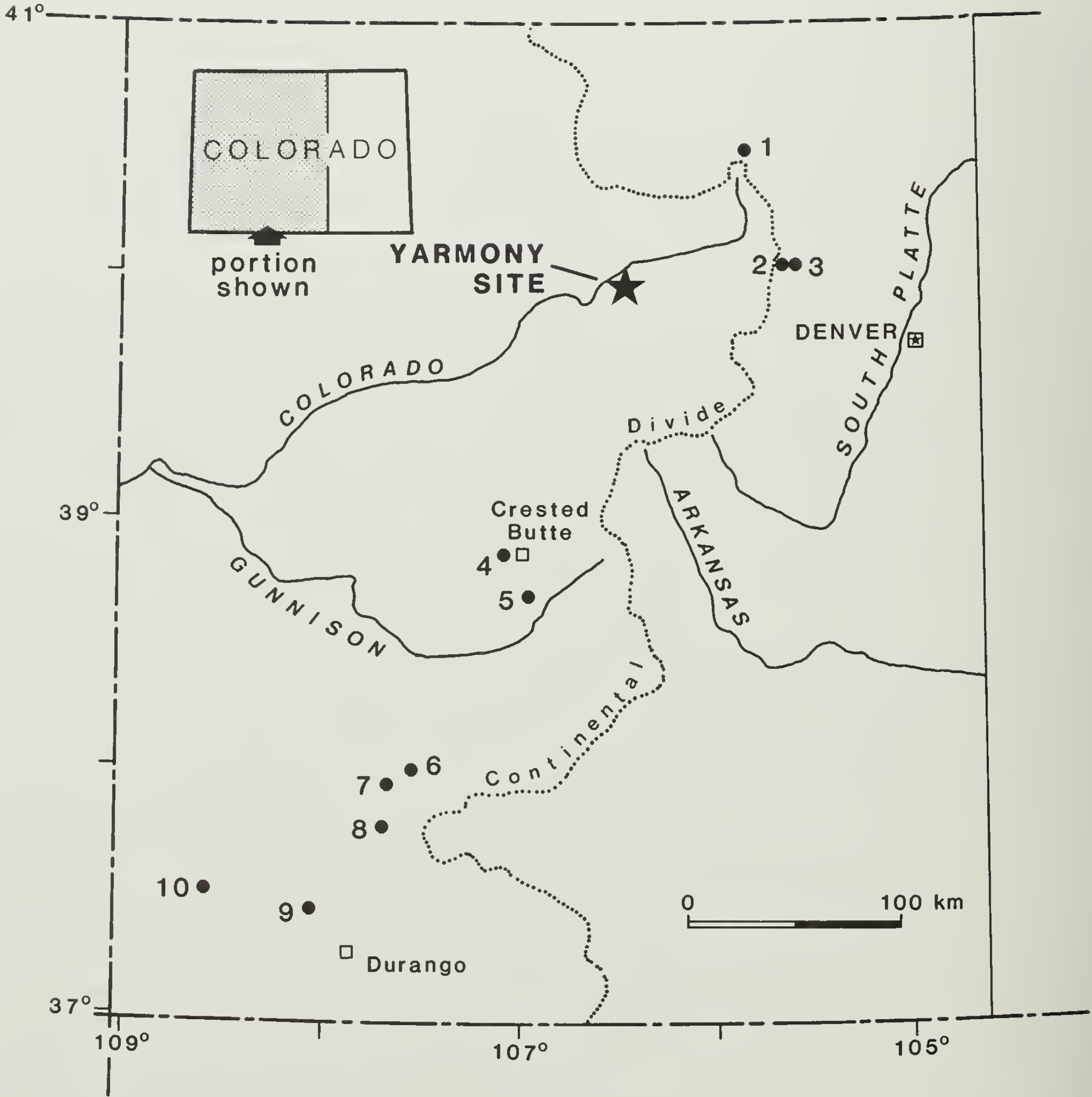
In montane Colorado, fluctuations in temperature and precipitation during Holocene time are interpreted mainly from changes in the elevation of upper and lower timberlines, deduced from pollen profiles and plant macrofossils, such as wood, conifer needles, and seeds. Upper timberline is controlled chiefly by summer temperature, whereas lower timberline is controlled by precipitation. To date, most work has concentrated on changes in the upper timberline. Only Markgraf and Scott (1981), Fall (1985, 1988), and Petersen (1985) have investigated elevational changes of both the upper and lower timberlines.

The studies of Markgraf and Scott (1981) and Fall (1985, 1988) near Crested Butte (Figure 5.7) are particularly relevant to the Yarmony site because of the similar climate and vegetation in these areas. In the Crested Butte area, as in the Yarmony area, a patchy, poorly developed montane forest is transitional between sagebrush steppe below and subalpine forest above (Fall 1985). The zones of lower montane forest and adjoining grassland that are so well developed along the east flank of the Front Range (Marr 1961) are not present in the Crested Butte and Yarmony areas.

Interpretations of Holocene vegetational history and paleoclimate developed in the Crested Butte area (Markgraf and Scott 1981; Fall 1985, 1988) differ from previous views of Holocene paleoclimate in that they do not find evidence of a major mid-Holocene (Altithermal) drought. Instead, they describe an early and middle Holocene climate that was both warmer and wetter than today's, followed by a warm, dry climate in late Holocene time. Although their conclusions differ from those of previous studies, they are consistent with experimental data and a model based on changes in earth-orbit parameters (perihelion, axial tilt, and eccentricity) described in a series of papers (Kutzbach 1981; Kutzbach and Otto-Bliesner 1982; Kutzbach and Guetter 1984a, 1984b, 1986; Kutzbach and Street-Perrott 1985; Webb *et al.* 1987).

Atmospheric circulation-model experiments done at 3000-year intervals for the past 18,000 years, the period between the last full glacial and the present, indicate that changes in earth-orbital parameters should have caused increased seasonality and an intensification of monsoonal effects between 12 and 9 ka (Figure 5.8). The time of perihelion (closest approach of the earth to the sun) has shifted from the month of January at 18 ka to July at about 10 ka and back to January at present. During this same period, the tilt of the earth's axis changed from approximately 23.5° at 18 ka to approximately 24.5° at about 10 ka, and back to the present 23.45°. As a result of these changes, the solar radiation received at the top of the atmosphere was about 8% greater in June through August over the northern hemisphere about 10 ka than it is today; similarly, it was about 8% less in December through February at 10 ka than today. Consequently, at about 10 ka, the interiors of continents became warmer in summer and cooler in winter than today. On the other hand, ocean temperature is believed to have remained about the same because increased warming in June through August was balanced by a corresponding decrease in December through February, and, unlike the continents, the oceans have a large heat-storage capacity that would have damped the response to greater June through August heating (Kutzbach and Street-Perrott 1985). The greater heating of continental interiors relative to oceans during this time intensified monsoons. Paleoclimatic evidence from Africa, Arabia, and India indicates that monsoon rains were stronger between 10 and 5 ka than today (Kutzbach 1981).

Markgraf and Scott (1981) studied the vegetational history of a site near the head of Alkali Creek about 16 km south of Crested Butte, Colorado (Figure 5.7). The site is at an elevation of about 2800 m; it is surrounded by shrub steppe vegetation dominated by big sagebrush and is about 200 m below the lower timberline. Markgraf and Scott (1981) identified two major paleoclimatic changes in the pollen profile on Alkali Creek: (1) a change at about 10 ka from cool and moist to warm and moist, which persisted until about 4 ka, and (2) a change at about 4 ka to warm and dry, which persisted to the present. They attributed the two climatic changes to a northward shift of the summer monsoonal

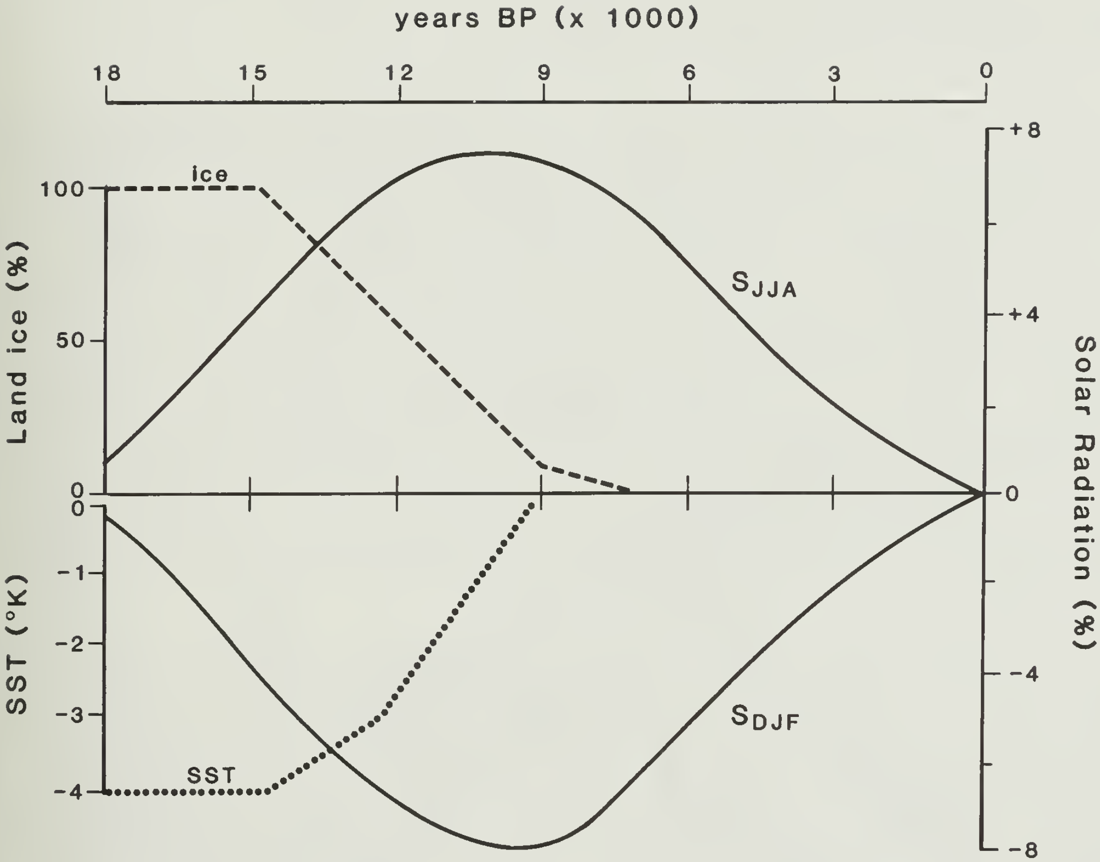


1. La Poudre Pass Bog (Short 1985)
2. Lake Isabelle Bog and Long Lake (Short 1985)
3. Red Rock Lake (Pennak 1963; Maher 1972)
4. Keystone Ironbog (Fall 1985)
5. Alkali Basin (Markgraf and Scott 1981)
6. Hurricane Basin (Andrews and others 1975)
7. Lake Emma (Carrara and others 1984)
8. Molas Lake (Maher 1963)
9. Twin Lakes (Petersen and Mehringer 1976) and Beef Pasture (Petersen 1985)
10. Sagehen Marsh (Petersen 1985)

Sites in the Southern Rocky Mountains for which Holocene pollen profiles have been published.

HOLOCENE POLLEN-PROFILE SITES

FIGURE 5.7



Schematic diagram redrafted from Kutzbach and Street-Perrott (1985; published with permission of Nature) showing major changes since 18,000 BP in (1) external forcing--northern hemisphere solar radiation in June-August (S_{JJA}) and December-February (S_{DJF}), as percent difference from present and (2) internal boundary conditions--land ice, as percent of 18,000 BP ice volume, and global mean-annual sea-surface temperature (SST), in °K departure from present. Curves for aerosol and atmospheric CO_2 have been omitted to emphasize relationships discussed in text. Simulation experiments were done at the 3000-yr interval shown on the time scale, from full-glacial conditions at 18,000 BP to the present. At 18,000 BP, land ice was at a maximum and sea-surface temperature was at a minimum.

SOLAR RADIATION, LAND ICE, and SEA-SURFACE TEMPERATURE since 18,000 BP

FIGURE 5.8

boundary, which presently crosses central Colorado (Figure 5.9), at about 10 ka, then a southward shift of this boundary as the subtropical high-pressure zone contracted to lower latitudes at about 4 ka.

Fall (1985, 1988), in a study of the vegetational history of Keystone Ironbog near Crested Butte (Figure 5.7), showed that the montane ecosystem expanded during early and middle Holocene time; upper timberline rose and lower timberline descended. The Keystone Ironbog, at an elevation of about 2920 m, is near the ecotone of the upper montane and subalpine forest zones. Pollen profiles at Keystone Ironbog and other small drainage basins in central Colorado between elevations of 2750 m and 3700 m led Fall (1985, 1988) to conclude that early and middle Holocene time was both warmer and wetter than today. Pollen profiles and plant macrofossils from these small drainage basins indicate that between 8.2 ka and 2.5 ka, upper timberline was at least 200 m higher than it is today. Based on lapse rates for mean July temperatures of 6.93° C/1000 m, this change in timberline elevation indicates that summer temperatures were at least 1.4° C warmer than at present. Fall (1988) also used present-day relations between precipitation and altitude (an increase of 250 mm/1000 m) to conclude that between 8.2 ka and 3.6 ka, lower timberline was 100 to 200 m lower than today, and that mean annual precipitation may have been as much as 50 mm greater.

Besides negating the occurrence of a major mid-Holocene (Altithermal) drought in this region, the conclusions of Markgraf and Scott (1981) and Fall (1985, 1988) also conflict with the proposed occurrence of early Holocene cirque glaciation in several places in the western United States (Beget 1983; Burke and Birkeland 1983). In recent years, however, evidence of early Holocene glacial advances has become controversial, and the validity of the existence or advance of early Holocene glaciers anywhere in the western United States has been disputed (Davis and Osborn 1987). The questionable early Holocene advances include the Ptarmigan advance (Benedict 1981, 1985) in the Front Range at about 7.25 ka to 6.38 ka, the Grenadier and Yankee Boy advances (Carrara and Andrews 1976) in the San Juan Mountains, and others in various parts of the Southern and Middle Rocky Mountains (see Burke and Birkeland 1983, Table 5.3).

Additional evidence that climate in montane Colorado was warmer than present from at least 9.6 ka to 5.4 ka comes from an exceptionally complete stratigraphic record of ^{14}C-dated wood in lacustrine sediment from Lake Emma in the San Juan Mountains (Carrara *et al.* 1984; Carrara 1988). Carrara (1988) presents evidence, including 38 ^{14}C ages of fossil wood, that between 9.6 ka and 5.4 ka and again at 3.1 ka timberline was at least 80 m higher than today. The increase in upper timberline elevation during these times is probably a minimum because Lake Emma is only about 80 m above present timberline. Previously, Madole (1986b) attributed a gap in the age distribution of Lake Emma wood from about 7.8 ka to 6.7 ka (Carrara *et al.* 1984, Figure 5.6) to a lowering of timberline similar to the recession of timberline between 7 and 6.7 ka reported for the Jasper National Park area, Alberta (Kearney and Luckman 1983). However, additional ^{14}C age determinations of Lake Emma wood (Carrara 1988) show that timberline elevation was not lower between 7.8 and 6.7 ka; hence, climate was probably not cooler during this time than it is today.

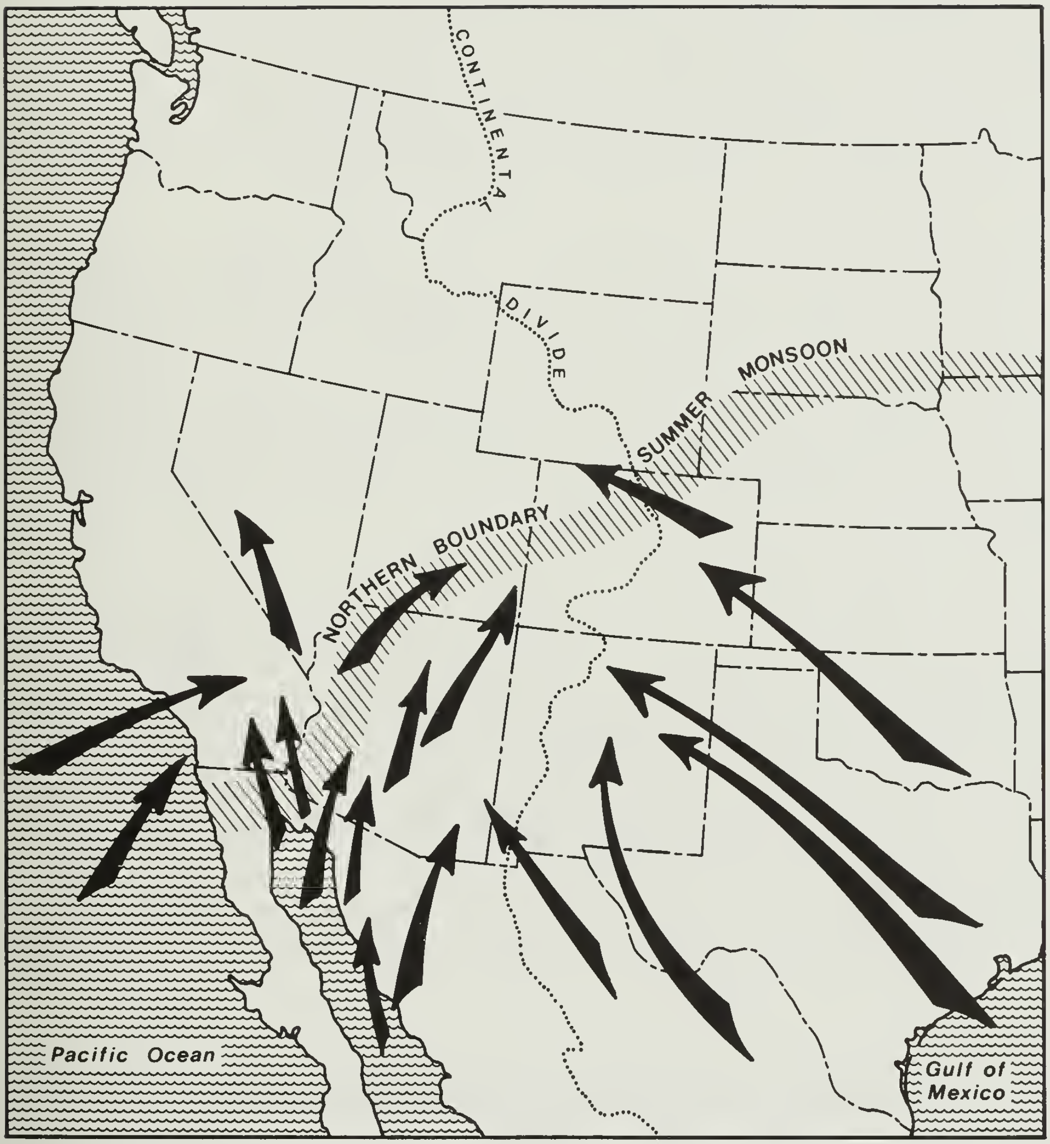


Diagram redrafted from Peterson (1985) showing the northern boundary of the summer monsoon (after Mitchell 1976; Bryson and Lowry 1955), and the principal paths of moisture (arrows) into central Colorado during the summer (after Miller and others 1973).

SUMMER MONSOON BOUNDARY, MOISTURE PATHS

FIGURE 5.9

Late Quaternary Paleoenvironments at the Yarmony Site

The succession of paleoenvironments that have come and gone at the Yarmony site is reconstructed from a meager stratigraphic record that, of necessity, is supplemented by data from other sites in montane Colorado. These data are interpreted within the context of the paleoclimatic model summarized above (Kutzbach 1981; Kutzbach and Otto-Bliesner 1982; Kutzbach and Guetter 1984a, 1984b, 1986; Kutzbach and Street-Perrott 1985; Webb *et al.* 1987). Given the limited available paleoclimatic data, the reconstruction of Holocene environment presented here is in the nature of a hypothesis.

The features of the stratigraphic record at the Yarmony site that may have paleoclimatic significance are (1) the prominent unconformity between strata of Pleistocene and Holocene age; (2) the absence of upper Pleistocene and lower Holocene sediment; (3) the thin cover (generally 0.5 to 0.9 m) of middle to upper Holocene sediment containing two minor disconformities, each marked by a weakly developed paleosol; (4) the fact that most Holocene sediment was deposited after about 6.4 ka, initially in channels, and later in two blankets of sheetwash, the upper of which is distinctly sandier and less calcareous than the lower; and (5) the incision of arroyos and formation of small alluvial fans in near-historic and historic time.

The erosional unconformity between unit 1 and the Holocene units at the Yarmony site was probably cut, at least in part, during late Pleistocene and early Holocene time. Apparently, the runoff that eroded the upper part of unit 1 was focused by the same system of gulches that controlled the initial movement and emplacement of the debris-flow deposits. Relict soils on more gently sloping surfaces, such as those underlain by middle Pleistocene alluvium and colluvium both east and west of the Yarmony site (Figure 5.1), were not as severely eroded as the soil in unit 1. It is hypothesized that sheet and rill erosion and the formation of shallow channels like that in which unit 3 was deposited occurred mainly between 12 ka and 6 ka, during the period of intensified summer monsoons that culminated about 9 ka (Kutzbach 1981; Kutzbach and Street-Perrott 1985). The absence of upper Pleistocene and lower Holocene sediment at the Yarmony site may be attributable to a general prevalence of erosion over deposition during this time.

Of the several factors that control erosion on hillslopes, it is generally agreed that the amount and kind of vegetative cover is by far the dominant control (Petts and Foster 1985, p. 123), and that the greatest sediment yield is in semiarid regions (Langbein and Schumm 1958) (Figure 5.10). Knox (1984) showed that even in humid regions such as the upper Mississippi River valley, small-scale changes in climate (for example, 1-2° C in mean annual temperature and a few centimeters in mean annual precipitation) were sufficient to produce significant hydrologic and geomorphic adjustments. Previously, Knox (1979) had shown that the ratio of average annual sediment yield to average annual water yield remains small and relatively unchanging in humid regions where vegetation is dense, but increases sharply in semiarid and arid regions where vegetation is much less dense and areas of bare soil exist (Figure 5.11). Noble (1965) found that in areas of herbaceous vegetation in the subalpine zone of Utah, soil erosion increased rapidly when the percentage of bare ground became greater than 30%.

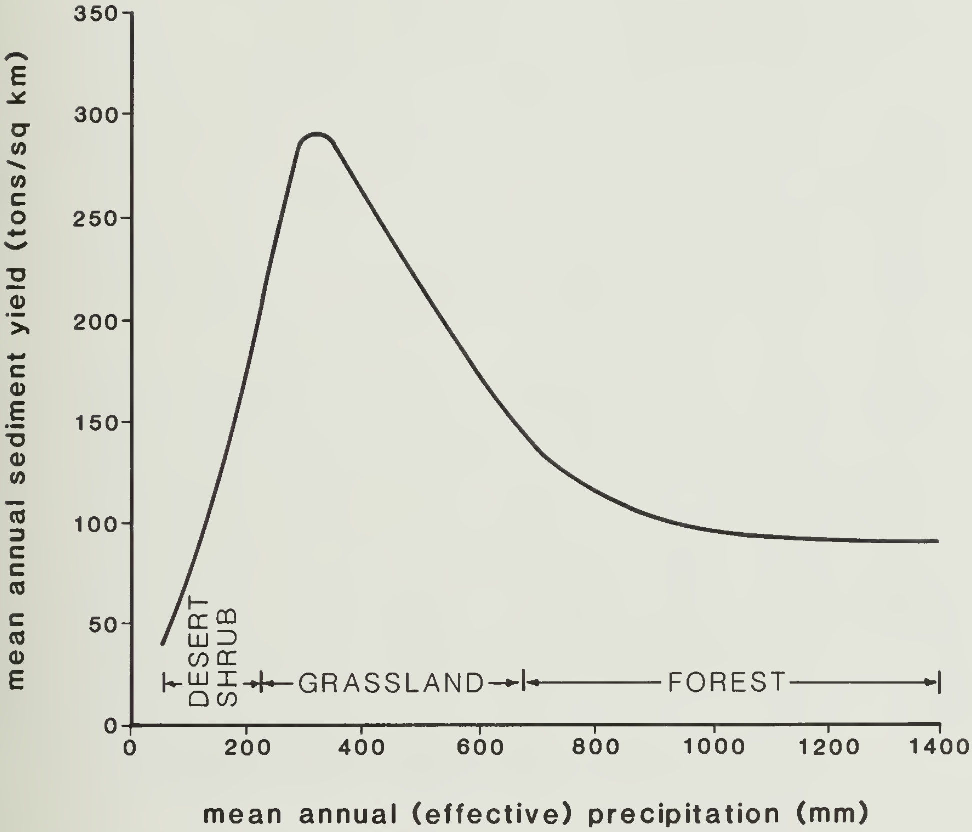


Diagram of mean annual sediment yield relative to mean annual precipitation and 'egetation association where mean annual temperature is 10° C (redrafted from Knox 983, after Langbein and Schumm 1958). Although sediment yield increases as the ercentage of bare ground increases (Noble 1965), mean annual sediment yield decreases rom subhumid and semiarid grasslands to desert because of decreased frequency of rain ind runoff.

MEAN ANNUAL SEDIMENT YIELD and MEAN ANNUAL PRECIPITATION

FIGURE 5.10

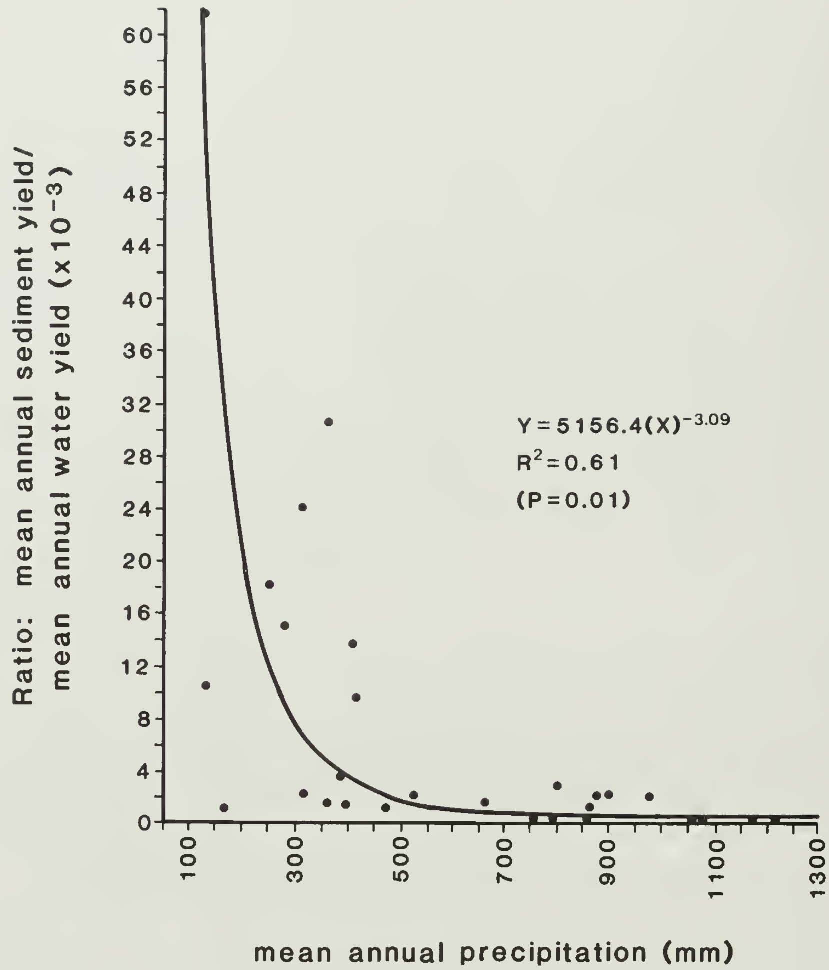


Diagram showing that the ratio of average annual sediment yield to average annual water yield is small and relatively constant in humid regions where vegetation is dense, but changes markedly in semiarid and arid regions where vegetation density is low (redrafted from Knox 1983).

Today, much of the ground in the Yarmony area is bare, and sediment yields are high enough to cause small deltas to form where gulches draining the area enter the Colorado River. However, the sparse sagebrush steppe vegetation of today has not always existed at the Yarmony site. At the time of Pinedale full-glacial conditions, the Yarmony site was probably within subalpine forest, given that the elevation of upper timberline in the Front Range was depressed 500 m below that of today at about 19 ka (Legg and Baker 1980; Madole 1986a). By 9.6 ka, upper timberline in the San Juan Mountains had risen to elevations higher than today (Carrara 1988). Also, trees were growing on the summit of the southern Park Range 60 to 70 km north of the Yarmony site by 8960 ± 80 B.P. (W-5032), the age of a buried log at the BP-3 site of Madole (1980:Fig. 1). Although the elevation of upper timberline by 10 ka was near, or possibly even above, that of today, lower timberline elevation was lower than it is today (Fall 1988). At the beginning of Holocene time, the Yarmony site may have been near the lower limit of montane forest.

The paleoclimatic model and biotic proxy data summarized above imply that summers during the period from about 10 to 8 ka were the warmest and wettest of Holocene time, but that winters were also correspondingly colder during this period. The differential between summer and winter extremes decreased toward middle Holocene time (Figure 5.8). According to Fall (1988), in the Crested Butte area, the vegetational response to the early Holocene thermal maximum peaked at about 5.8 ka, which is close to the time when the Yarmony pit houses were occupied. Today, the Yarmony site is in sagebrush steppe, but at the time the pit houses were occupied, it was much nearer to the lower limit of montane forest, given that this limit was 100 to 200 m lower at that time (Fall 1988). According to the paleoclimate model (Figure 5.8), both mean annual temperature and precipitation were higher at the Yarmony site during the time the pit houses were occupied than they are today.

By 5 ka, the contrast in summer temperature between continental interiors and oceans had decreased. The time of perihelion was about midway between the July date of 9000 years ago and the January 3 date of the present. Likewise, the change in the tilt of the earth's axis was also about midway between its position of 9 ka and the present. Consequently, the subtropical high-pressure centers contracted toward the equator and penetration of the summer monsoon into central Colorado was restricted in extent and frequency. As the northern boundary of the summer monsoon moved southward, incursions of warm, moist tropical air decreased, and Colorado summers became cooler and drier under the influence of Pacific air. Westerly winds became more dominant, and a greater proportion of mean annual precipitation came in winter as snowfall from airstreams originating over the Pacific.

Climate cooled in middle and late Holocene time, probably because mean summer temperature declined as warm tropical air associated with monsoonal circulation became less influential. A reduction of mean summer temperature caused the elevation of upper timberline to shift downward. At the same time, the elevation of lower timberline moved upward in response to reduced summer precipitation (Fall 1985, 1988). At the Yarmony site, channels cut in early Holocene time became progressively ephemeral and eventually began to aggrade with sheetwash alluvium as the influence of monsoonal circulation waned. Judging from the stratigraphic record, the late Holocene was a time of slow alluviation marked by two short intervals of stability during which weakly developed

paleosols formed in units 3 and 4. Little is known about the role of local, nonclimatic controls on alluviation and stability at the Yarmony site in late Holocene time.

Today, a discontinuous grass cover is present at the Yarmony site, and the distribution of the weakly developed soil in unit 5 seems to be related to the presence of grass, or, conversely, the absence of grass allows the A horizon to be eroded away. Times of thicker, more extensive grass may have reduced sediment transport by sheetwash and allowed a more distinct soil A horizon to develop. In temperate middle-latitude regions, grasslands require annual precipitation in amounts of 400 to 500 mm; however, the precipitation required for maintenance of grasslands varies with the amount lost by evaporation. Effective moisture, the amount available for plant growth, rather than total precipitation, is a more meaningful parameter in the relationship between plant cover and soil erosion. The precipitation received at the Yarmony site during those periods in the late Holocene when cirque glaciers were expanding at higher elevations (times of cooler summers) was probably more effective in nurturing plant cover than the precipitation received during nonglacial intervals. Hence, it is hypothesized that development of the weak soils in the Holocene units at the Yarmony site was coeval with late Holocene cirque-glacier advances in the higher parts of the Southern Rocky Mountains.

Arroyos are prominent features in the Yarmony area today, but probably were not an important part of the landscape during the time that the pit houses were occupied. McPhee Gulch and the many other arroyos in the area probably were incised between 150 and 100 years ago, a time when arroyo cutting was widespread in the Colorado Plateau, the southern part of the Basin and Range physiographic province, the Southern High Plains (Cooke and Reeves 1976; Graf 1983), and the Osage Plains (Madole *et al.* in press).

Acknowledgments

I thank Stephen F. Personius and Lynn A. Yehle for thoughtful manuscript reviews and suggestions for improving this chapter. Thanks are also due the following individuals for permission to reproduce their work: James C. Knox, University of Wisconsin, for Figures 5.10 and 5.11; John E. Kutzbach, University of Wisconsin, and F. Alayne Street-Perrott, Oxford University, England, for Figure 5.8; and Kenneth L. Petersen, archeologist, Richland, Washington, for Figure 5.9.

CHAPTER 6

RESULTS OF EXCAVATIONS

by Michael D. Metcalf

Introduction

Although most of the Yarmony site remains unexcavated, four loci have seen varying degrees of excavation and, additionally, scattered test units cover most of the defined site area (Figure 6.1). Most productive and dramatic are the Early Archaic period house structures dating just before 6000 BP, but an earlier activity area, the Road Cut Locus, and a later large burned rock midden area, Feature 14, also date from the Early Archaic period. Cultural remains occur in a poorly defined area north of the Pit House Locus which are also of likely Early Archaic age. Late Archaic remains may occur in the site, but thus far no discrete activity areas have been identified. Finally, the Ceramic Locus has been extensively excavated, also north of the Pit House Locus. Each of these spatial units is discussed below.

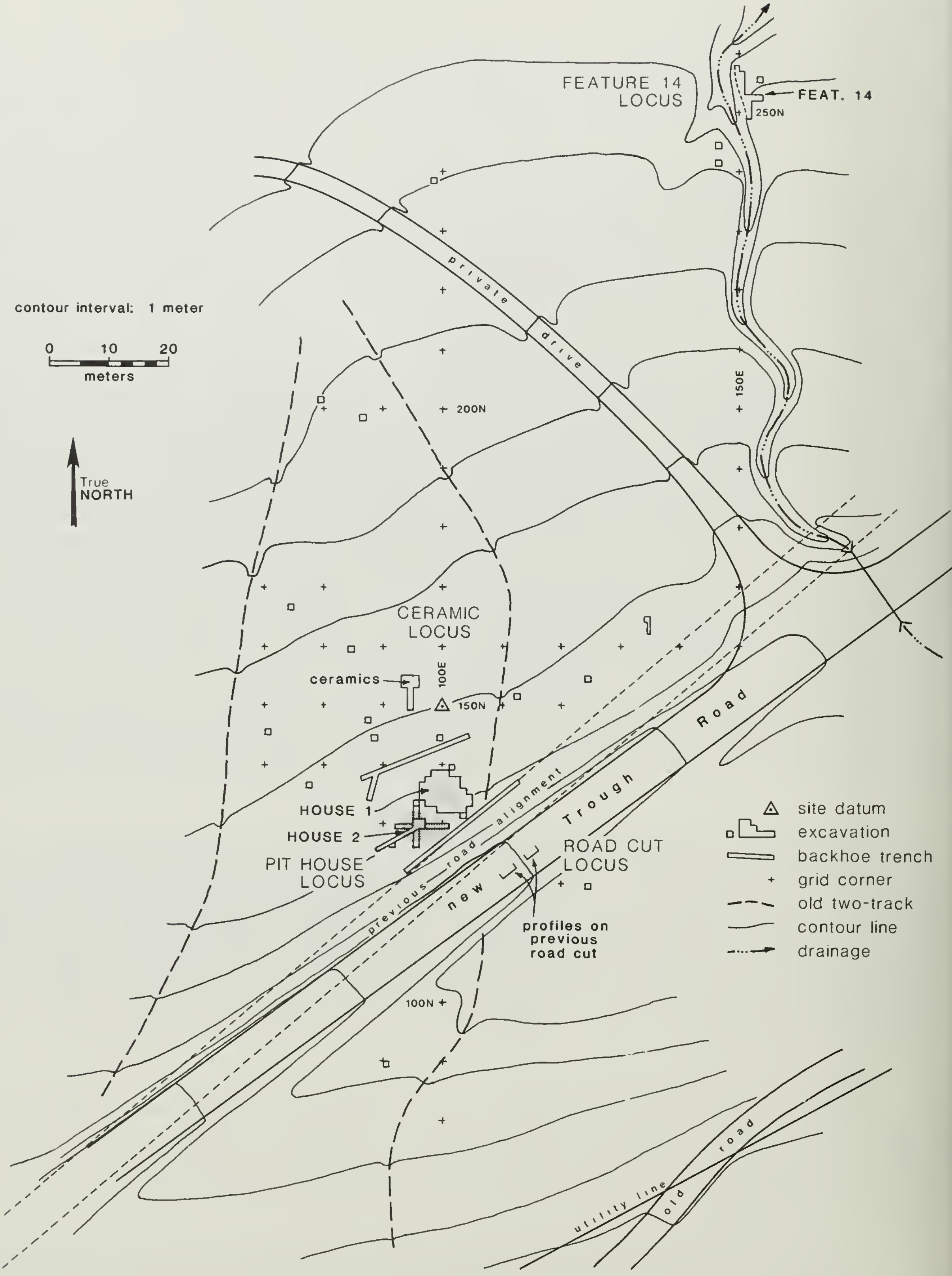
Radiocarbon Dating

Nine radiocarbon dates were processed from charcoal or charcoal-stained fill recovered during the excavations at Yarmony. These dates are listed in Table 6.1.

Radiocarbon dates of 6320 ± 90 (Beta-21197), 6330 ± 110 (Beta-25075), 6290 ± 70 (Beta-25077) and 6290 ± 150 (Beta-23788) are assumed, based on context, to represent the occupation of House 1. To test their contemporaneity, Long and Rippeteau's test of non-coevalness using the F-test was applied (1974:210-211). After correction by methods described by Damon *et al.* (1974), F was calculated for these four dates and was considerably less than 1 (0.022) indicating no significant difference in the four dates. These four corrected dates were then averaged, following Long and Rippeteau (1974:206-210). The result of the averaging is a calendric date of 7131 ± 67 BP for occupation of House 1.

Radiocarbon dates of 6030 ± 100 (Beta-25076) and 6080 ± 100 (Beta-25079) are assumed, again based on context, to represent occupation of House 2. Following the same strategy as described for the House 1 dates, a test of non-coevalness resulted in an F of less than 1 (0.091) indicating no significant difference in the dates. Their average is a calendric date of 6884 ± 83 BP for occupation of House 2.

Finally, the two averaged, calendric dates for the House 1 and House 2 occupation were tested for contemporaneity. Following the method described by Long and Rippeteau (1974:210-211) using the t-test, a t value of 2.32 was



YARMONY SITE, 5EA799

FIGURE 6.1

Table 6.1
Radiocarbon Dates and Corrections

Lab Number	FS no.	Date RCYBP	Date, corrected*, BP	Context
Beta-21197	FS 1266	6320 ± 90	7143 ± 127	House 1 floor
Beta-25075	FS 74	6330 ± 110	7153 ± 141	House 1 fill, 50-55 cmbd, 135N 105E
Beta-25076	FS 179	6030 ± 100	6859 ± 117	House 2 midden, in House 1 basin, 135N 100E
Beta-25077	FS 206, 661	6290 ± 70	7114 ± 113	House 1, small room floor area
Beta-25078	FS 250, 255	7050 ± 200	7810-7930**	East Road Cut, 45-55 cmbd
Beta-25079	FS 719, 721	6080 ± 100	6909 ± 117	House 2 floor, 130-131N 96-97E
Beta-23787	FS 328	1230 ± 60	1209 ± 79	134N 104E, 10-20 cmbs
Beta-23788	FS 1477	6290 ± 150	7114 ± 174	134N 103E, 123-130 cmbd
Beta-28131	FS 2002	4790 ± 70	5529 ± 114	Feature 14

* corrections follow methods outlined by Damon *et al.* (1974)
** approximate calendric correction for this date from Kromer *et al.* (1986)

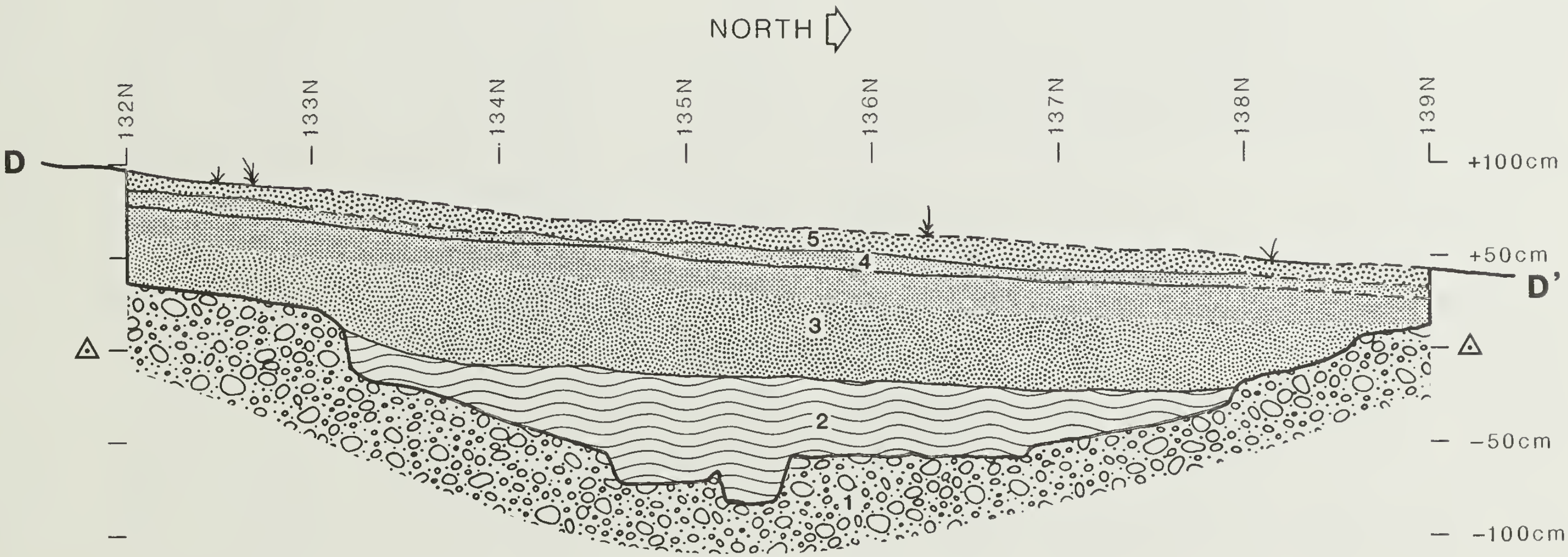
calculated. At infinite degrees of freedom, this t value represents a one-tailed probability of 1%. Based on this very low probability, House 1 and House 2 are confidently assumed to have been occupied at two distinct times.

Cultural Stratigraphy

As detailed by Madole in Chapter 5, five stratigraphic units are recognized at Yarmony (Figure 6.2). Unit 1 is the Middle Pleistocene-aged landslide deposit that immediately underlies the cultural sequence of the site. A disconformity separates this unit from the overlying cultural units. The earliest Yarmony date of 7050 ± 200 (Beta-25078) comes from the Road Cut Locus and applies to cultural material that was deposited either directly on or in a very thin soil mantle that began accumulating on Unit 1 at about this time.

Next in the cultural sequence is the Pit House Locus where two pit house structures yielded six dates between 6330 ± 110 (Beta-25075) and 6030 ± 100 BP (Beta-25076). Within the pit houses, Unit 2 occurs as cultural fill from the houses. Site-wide, however, Unit 3 was deposited between roughly 7000 and 4800 BP with the pit houses dating to very early in the period. No well-defined occupations occur in this soil outside of the Pit House Locus but some material, including projectile points, overlies the house structures in Unit 3, and there is a thin scattering of cultural debris in lower Unit 3 in an area northeast of the houses.

Within the Pit House Locus, House 1 was occupied first, with dates of 6320 ± 90 BP (Beta-21197), 6290 ± 150 BP (Beta-23788), and 6290 ± 70 BP (Beta-25077). A date of 6330 ± 110 BP (Beta-25075) comes from the Unit 1 contact just outside House 1. House 2, located just a few meters southwest, has a floor date of 6080



△ Vertical datum (zero elevation)

UNIT 5 Recent aeolian and sheetwash deposits, weak soil development.

UNIT 4 Paleosol, weak A–C horizonation.

UNIT 3 Culturally rich paleosol, weak A–C horizonation, probably accumulated in paleochannel or other depression.

UNIT 2 Pithouse fill, cultural in origin, does not extend away from pithouses.

UNIT 1 Diamicton of debris-flow origin, probably middle Pleistocene in age.

see Figure 6.5 for profile location

see Figure 5.4 for soils detail

SOIL PROFILE ACROSS HOUSE 1

± 110 BP (Beta-25079). Confirmation of House 2 in 1987 clarified the depositional sequence in the fill of House 1. During the 1986 excavations, it was noted that excavation levels well above the floor of House 1 were rich in cultural debris, and charcoal from these levels dated to 6030 ± 100 BP (Beta-25076). It is now clear that the abandoned basin of House 1 served as a trash dump for the occupants of House 2. Similarities in architecture, projectile point styles, and other aspects of the material culture indicate continuity in the cultural tradition between house occupations.

An unconformity separates Units 3 and 4. Feature 14, a charcoal-rich midden deposit, was deposited in lowermost Unit 4 and dates to 4790 ± 90 BP (Beta-28131). Thus, Unit 3 was deposited entirely within the Early Archaic period.

Cultural material associated with Feature 14 includes a side-notched point fragment suggestive of the Mount Albion complex. Unit 4 accumulated up to 37 cm in thickness after this date. Charcoal from a stain in the Pit House Locus, which is derived from the Unit 4 - Unit 5 contact zone, dates to 1230 ± 60 BP (Beta-23787) and serves as a limiting age for Unit 4. All or most of Unit 4 was deposited prior to this date. A few artifacts are scattered in various levels in the Unit 4 soil. Most of the tools found in the soil, however, are stratigraphically above house features, and most appear to have been brought into Unit 4 by bioturbation. Late Archaic materials are likely to be represented at Yarmony, but a locus has not yet been discovered.

The last well-defined occupation of the site is the ceramic component which is partially exposed on the surface and is also buried, in uneroded areas, by Unit 5 soils. Nineteen sherds from at least two vessels were recovered, along with lithic debris and a surface find of a small, finely-serrated, corner-notched arrow point. Many of these sherds appear to have a nearly obliterated cord-roughened exterior finish similar to Plains Woodland specimens on the High Plains but fingernail impressions on two sherds are suggestive of a variety of Uncompahgre Brown Ware and suggest occupation early in the local Ute sequence.

Road Cut Locus

This area was exposed in the road cut of the Trough Road and received profile facing and three m^2 of excavation during 1987. Although only sparse cultural remains were found, sufficient charcoal was scattered with this cultural debris to provide a date of 7050 ± 200 BP (Beta-25078). The level which yielded this material is in contact with Unit 1 soils, and the scattered nature of the remains are suggestive of slight sheetwash disturbance prior to burial.

Chipped stone recovered here included 16 flakes and two end scrapers. Burned and unburned mammal bone was also recovered including one identifiable element of bison, one of jackrabbit, four of elk/bison-sized mammal, and 49 other fragments not identifiable to species. Some 60% of this material is burned. The condition of the bone in this area is indicative of prolonged surface exposure prior to burial.

Rood (Chapter 8) interprets this locus as an area where faunal processing occurred, and the end scrapers are supportive of this conclusion. The finely divided nature of the charcoal suggests that it originated from a nearby hearth

feature. Flake types and low flake densities suggest that flintknapping in this locus was in support of some other activities - bifacial thinning and resharpening flakes are dominant.

One end scraper is made of an orange-brown chert not common on the site. The remaining pieces of chipped stone are of local materials.

The original purpose of excavations in the road cut was to provide a good profile for the rocky, sloping area south of the Pit House Locus. This profile is typical for this upslope section of the site. The basal date of 7050 BP for deposition of Unit 3 is important to stratigraphic interpretations. The eroded nature of the subsurface deposit was apparent during excavation and is the reason such a small area was dug. In spite of the low density of cultural remains in these units, the remains are quite informative, suggesting a pattern of continuity in faunal utilization. This area remains intact, but is buried beneath fill under the new Trough Road.

The Pit House Locus

This area of the site is the most extensively excavated and displays the most concentrated evidence of prehistoric use of the site. Here, 66 m^2 of block excavations and three backhoe trenches have located two pit houses and suggested the presence of outdoor activity areas. House 1 was completely excavated in 1987 because of its position within the new alignment of the Trough Road. Through the efforts of the Eagle County Road and Bridge Department, the house was finally avoided by construction.

House 2 was penetrated by a 2 m x 2 m unit and a short backhoe trench in 1987, but was not conclusively recognized as a house until follow-up excavations in 1988 under Bureau of Land Management sponsorship. A profile in a backhoe trench in the borrow ditch of the old Trough Road has oxidation and staining within a dip in the profile and may indicate the presence of a third house. Few artifacts were found during hand sampling in the profile, and the character of the fill within the dip is different than that in the two houses. During fieldwork, it was identified as a small channel or rill, an interpretation that still seems possible (Figure 6.3). The feature, whatever its true nature, lay under the existing road and further excavation was not practical. It remains buried beneath road fill.

House 1

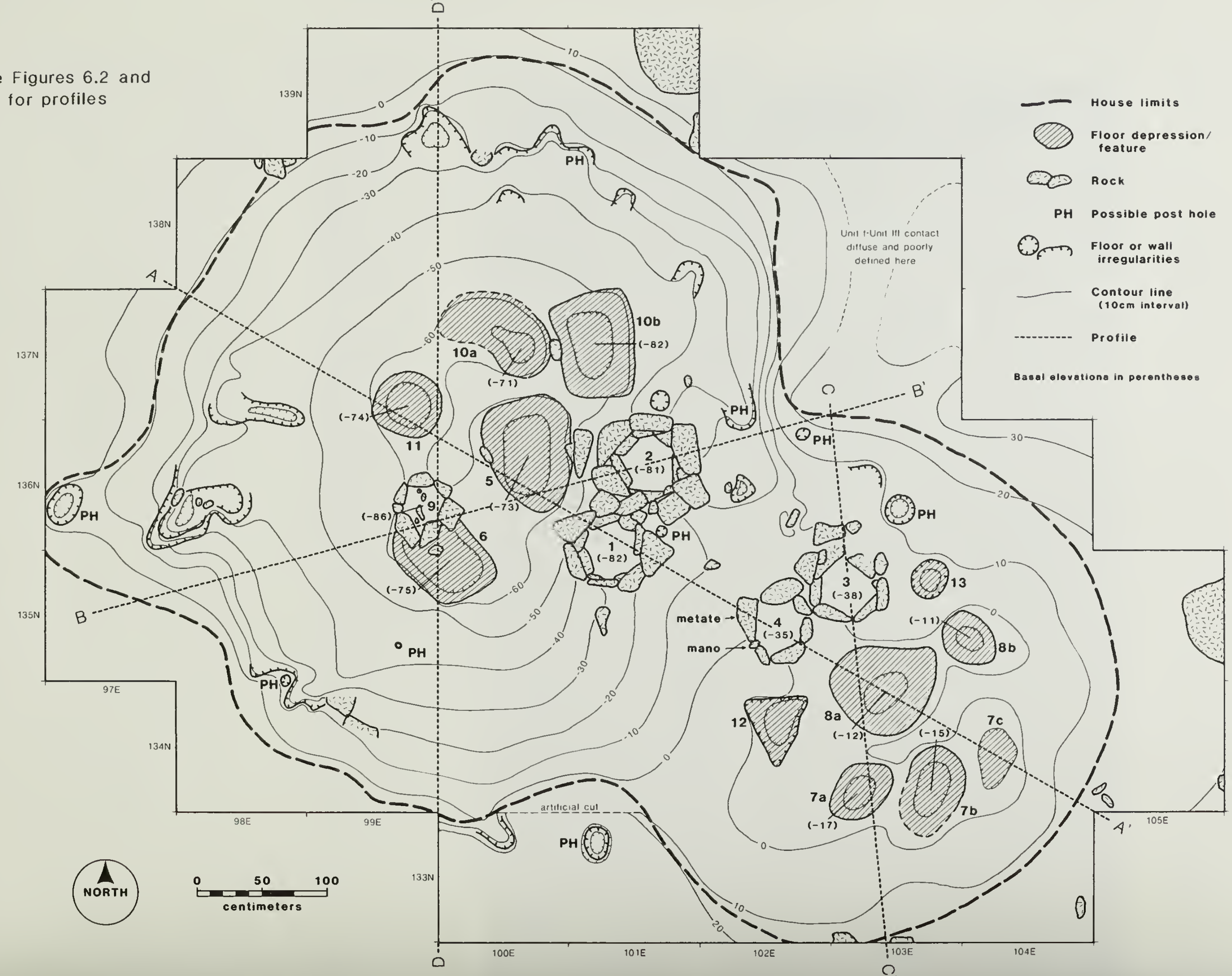
The floor plan of House 1 is shown in Figures 6.4 and 6.5 and profiles of the feature in Figure 6.6. The structure is two-roomed with a small, shallow room or entry area adjoining a larger, deeper house basin. The large house basin is slightly oval in plan with diameters ranging from about 5 to 5.8 m. It was excavated to a maximum depth of about 0.8 m below the estimated native surface. It is steep-walled and has a sloping floor. The adjoining room is more nearly circular, has a diameter range of 3.5 to 3.9 m, and was excavated no more than 0.25 m below estimated native surface. It is saucer-shaped in profile.

The arrangements of floor features in each house basin form near mirror images. Within each, there are two slab-lined storage cists, a shallow hearth,

FIGURE 6.3

South wall of the backhoe trench along the Trough Road in the Pit House Locus. A possible third pit house is represented by the dark stained soil which fills a depression truncated by the trench.

see Figures 6.2 and
6.6 for profiles

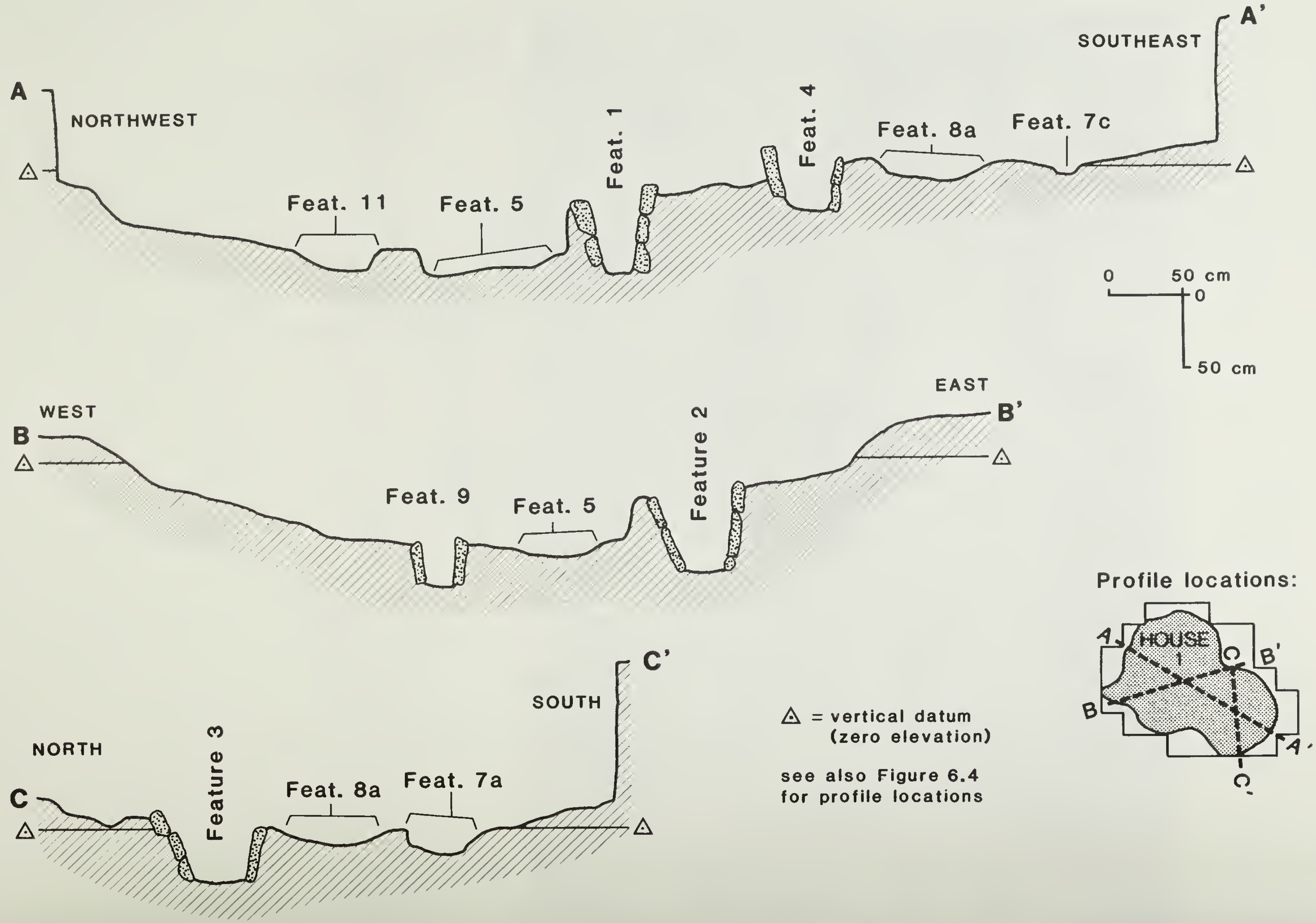


PLAN, HOUSE 1

FIGURE 6.4

FIGURE 6.5

House 1 after excavation was completed. South is to the top of the photo (upside down relative to map in Figure 6.4). The larger house is in the center, the smaller adjoining house is in the upper left. The dark area in the center of the larger house is caused by moisture.



HOUSE 1 PROFILES

FIGURE 6.6

and a cluster of shallow floor depressions. The large basin has an additional small slab-lined feature near its center. The small basin is nearly filled by these floor features, but extra space occurs around the northern, western, and southern perimeters of the large basin.

The fill within House 1 was dark and organic in nature. It included scattered charcoal pieces up to 1 cm in maximum dimension as well as hundreds of small, angular pieces of basalt, numerous artifacts, faunal scrap, and some ground stone fragments. This deposit is Madole's Soil Unit 2. Density plots of the artifacts and bone pieces above House 1 clearly show a peak in item frequency in a zone 45 to 65 cmbs underlain by a zone of lower artifact densities. This high density zone of artifacts originates from the House 2 occupation. At levels up to 20 cm above the house floor, structural remains such as daub, burned clay, large pieces of charcoal (1.5 to 2 cm), and oxidized soil occur, along with another increase in artifact densities. Artifacts also occurred in contact with the floor.

Interpretation of the shape of the superstructure is complicated by the lack of a clear posthole pattern. The house fill was riddled by rodent and predator burrows which penetrated to the Unit 1 contact and terminated as dens or lateral tunnels. With one exception, recognition of postholes was tenuous. Only the clearest holes are shown on the house plan and even these are not definitive.

The clearest example of a posthole is in the house interior and measures just 4 cm in diameter. Clearly, this is not a weight-bearing post. The largest possible postholes are on the house perimeter within, and slightly outside of, the pit structure. There is a distinct lack of evidence for large, vertical interior support posts.

Three ideas concerning the possible shape of the superstructure have been discussed, but all are highly conjectural given the limited evidence. One is the traditional view of pit houses with four interior supports, a flat roof, and sloping walls. This seems unlikely given the lack of interior postholes. A second possibility is for low exterior vertical walls supporting a clear spanned flat or conical roof. A final possibility is for a conical structure supported by main supports which intersect tipi style.

Construction materials are easier to interpret. Several fragments of burned, stick-impressed clay or daub were recovered. Impressions in one of these (see Figure 7.20b) suggests that the wet mud was plastered over a lattice of sticks which were ±5 cm in diameter. Patches and blobs of oxidized red-brown clay were common in fill above the floor level lending further support to the interpretation of wattle-and-daub roofing. Charcoal fragments from context suggestive of roof fall were submitted to Dr. Craig Shuler of the Forest and Wood Sciences laboratory at Colorado State University for species identification. Seven woody plant specimens were analyzed. Identifications include Douglas fir (2), lodgepole pine (3), Englemann spruce (1), and conifer (1). Some of this charcoal may have been fuel wood, but both of the Douglas fir and one of the lodgepole pieces were from definite roof fall contexts.

All of the identified woody species are available within 2 km of the site today, but none grow on-site. All occupy terrain at least 150 m higher than the site to the south on Piney Ridge.

The house floor was apparently unlined, but in a few areas, especially on the upper basin slopes, a thin veneer of brown to red-brown clay could sometimes be discerned during trowelling. Patches of oxidation of Unit 1 fill, probably resulting from a structural fire, were common on the floor and lower walls. A clay lining may have been applied, but if so, it was too thin to leave clear evidence.

No clear evidence of an entryway or ramp was found, but the most logical area, given the slope of floor and walls, would be along the southeast arc of the small house basin. Walls on the perimeter of the large basin are well defined, whereas the small basin is shallow, and an opening could be constructed anywhere traffic flow would allow. In fact, one possible interpretation is that the small basin was a covered entry/work area rather than totally enclosed space. The probable storage function of the slab-lined cists suggests enclosed space, however.

Floor Features. Features 1, 2, 3, and 4 are large, slab-lined cists or bins excavated into the house floor (Figures 6.7 and 6.8). The feature walls are lined with large basalt slabs and are intricately chinked with smaller stones so that even today there are no holes or cracks in the walls. The pit bottoms are unlined, but were evidently too deep in Unit 1 fill for rodent penetration to be a danger. Fragments of ground stone occur as chinking, and in Feature 4 one of the main slabs is a large basin metate. A loaf-shaped mano which appears to exactly fit the ground facet on the metate also forms part of the feature wall (Figure 6.9). The features in the large basin are deeper than in the smaller basin. Feature 9 in the large basin is also slab-lined (Figure 6.10), but this feature is smaller and less intricate than Features 1, 2, 3, and 4. Measurements are:

	F1	F2	F3	F4	F9
diameter	45-58 cm	40-48 cm	31-40 cm	32-38 cm	26-29 cm
depth	57 cm	54 cm	34 cm	28 cm	16 cm

Features 1, 2, 3, and 4 are interpreted as being storage facilities because of their intricate construction and the lack of evidence of burning within the fill. Plant food storage was hypothesized on the basis of the use of ground stone in feature construction and on the apparent rodent-proofing of the features. Feature fill was retained for water screening, flotation, and pollen analysis. Pollen was analyzed from Features 2, 3, and 9. Pollen recovery from the large bins was very poor. Feature 9 included elevated grass pollen counts relative to control samples. Flotation analysis of seven samples from the five slab-lined features yielded results very similar to the results from samples from other features and floor proveniences. Large numbers of charred cactus spines and one to three charred goosefoot seeds came from each sample. Feature 3 also yielded a charred skunkbrush seed (Van Ness, Chapter 9). These results, along with other samples, may indicate economic usage of these species, but there are no differences between storage cist and non-cist samples to support any functional interpretations.

FIGURE 6.7

Feature 1 (right) and Feature 2 (left), the paired lined storage cists in the larger room of House 1. Measuring from the outside of the rock linings right to left across the features is 1.42 m. View is east-southeast.

FIGURE 6.8

Feature 3 (right) and Feature 4 (left), the paired lined storage cists in the smaller room of the House 1. Measuring from the outside of the rock linings right to left across the features is 1.22 m. View is northwest.

FIGURE 6.9

Mano (arrow) and metate incorporated into the west wall of Feature 4.

FIGURE 6.10

Feature 9 (lined pit on the right) in the floor of the main room of House 1. Feature 6, an unlined basin, is adjacent to Feature 9 on the left. Folding rule is extended to 85 cm, trowel points north.

Flake counts from feature fill are low as compared to floor and general fill contexts and consist mainly of microflakes. No tools were recovered from slab-lined features. Faunal remains are also low in number from slab-lined feature fill and consist of a dog jaw and small fragments.

In the absence of more conclusive evidence, the interpretation is that Features 1, 2, 3, and 4 are storage facilities.

Feature 5 in the large house basin and Feature 8a in the small house basin appear to have been hearths. Both were relatively free of charcoal and ash, but each displayed clear oxidation in the feature basins. This oxidation - a reddish-orange rind - is more distinct than that underlying patches of roof or wall fall. Each is positioned in the center of the feature cluster in their respective house basins. Feature 5 is just under 1 m in diameter and has a shallow, relatively flat-bottomed basin about 15 cm deep. It is also characterized by a well-defined rim composed of Unit 1 soil (Figure 6.11) which separates it from adjoining features.

Feature 8a is similar in construction, but not as circular, and measures just 60 to 80 cm in diameter and is 13 cm deep (Figure 6.12). It appears to be paired with a smaller basin, Feature 8b, which is circular and measures about 34 cm in diameter by 12 cm deep. This pairing is similar to the juxtaposition of Feature 5 and Feature 10a. That feature is also irregular at floor level, but tapers to a nearly round basin about 45 cm in diameter and 20 cm deep.

Other features could best be described as floor depressions. Feature 6 is a sub-rectangular depression which measures 75 cm x 52 cm and reaches a subfloor depth of 18 cm. It slopes inward (northwest) and abuts the small, slab-lined Feature 9 (Figure 6.13). These features may form a functional pair for some sort of food processing. Features 7a, b, and c and Features 10b, 11, 12, and 13 are also shallow floor depressions which may be related to plant milling.

The Feature 7 complex forms a shallow arc south of the Feature 8a hearth. These basins are irregular in plan view, but dip about 12 to 13 cm below floor level. Feature 10b in the large basin is a sub-rectangular feature measuring 60 cm x 80 cm and is about 12 cm deep. Features 11 and 13 are similar - small, circular, shallow basins. Feature 11 measures 50 cm x 11 cm deep, and Feature 13 is 35 cm x 9 cm deep. Feature 12 is a triangular-shaped depression measuring about 60 cm on a side and is about 18 cm at its deepest point.

Functional interpretation of these floor features is difficult. One suggestion is that some may be milling "bins" where a mat or hide was laid in the hole, milling implements used on the hide, and the processed meal collected in the depression. Features 6, 10a, and 10b in the large basin, and the Feature 7 complex in the smaller basin seem best suited to this interpretation. Roasting, storage or unrecognized animal dens are also possibilities for some of the features.

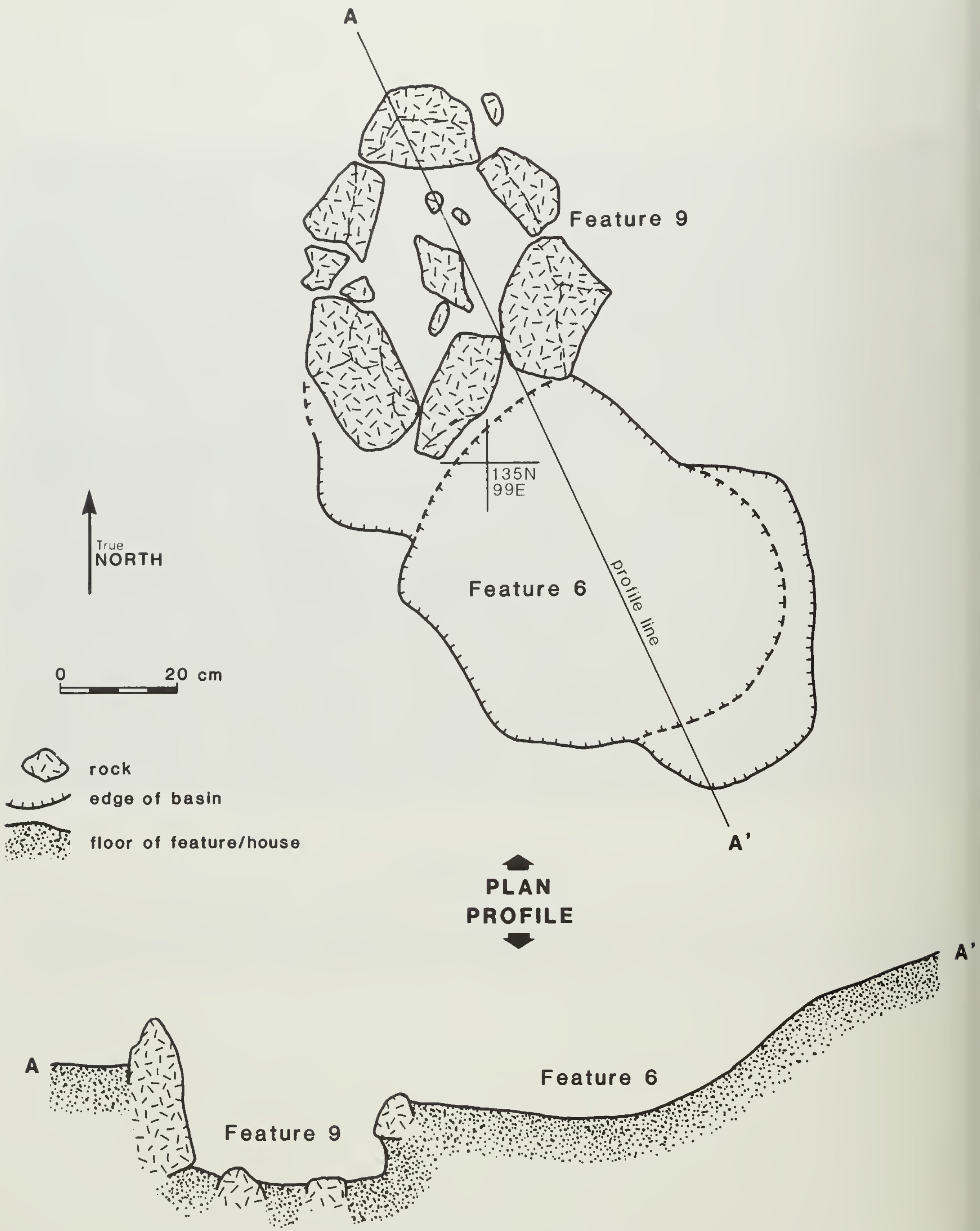
All features were sampled for pollen, flotation, and waterscreening, and artifact associations were traced. Pollen was analyzed from Feature 7b. This sample is similar to the level control sample in most respects, but shows the highest peak in Cheno-Am pollen of all analyzed samples. The flotation sample

FIGURE 6.11

Floor in the center of the larger basin in House 1. Features 1, 2, 5, 6, 9, 10a, and 10b are marked (Features 6 and 9 are only partially excavated). View is east-southeast, folding rule is extended to 102 cm.

FIGURE 6.12

Floor in the center of the smaller basin in House 1. Features 3, 4, 7a, 7b, 7c, 8a, 8b, 12 and 13 are marked. View is north, folding rule is extended to 102 cm.



FEATURE 6 and FEATURE 9

FIGURE 6.13

from this feature was similar to most other samples in having one charred *Chenopodium* seed and ±50 charred cactus spines. Flotation samples were also run on other features.

Table 6.2 is condensed from Van Ness (Chapter 9) and shows macrobotanical results from House 1.

It is apparent that there are very few differences between feature and general floor contents. The lack of patterning in goosefoot and prickly pear remains suggests a non-cultural source for these but, on the other hand, both are economic species. Both species colonize disturbed ground, however, and could have been growing in the house area when it burned. The subsistence implications of this will be dealt with in Chapter 10. It is interesting to note, however, that the cherry (*Prunus*) seeds both occur in the vicinity of the Feature 6/9 pair. The macrobotanical results, however, provide few clues to the function of the floor features.

Artifact distributions, while displaying some patterning within fill levels and across the house interior, are not especially helpful in functional interpretation of the features.

Table 6.2
Summary of Macrobotanical Analyses from House 1

Context	FS #	# charred Goosefoot	Approximate # charred Cactus Spines	Other
F1	1131	1	30	1 unknown
F1	1134	1	10	
F1	1137	1	30	
F2	1136	2	50	1 unknown
F3	1199	3	35	1 skunkbrush
F4	1197	1	10	
F5	1530	3	10	
F6	1460	2	30	1 cherry
F7a	1485			
F7b	1476	1	60	
F8a	1482		1	
F9	1484		20	
F10a	1315		30	
F10a	1316	2	30	
F11	1311	1	10	1 juniper
floor	1245	1	10	
floor	1312	1	25	
floor	1313	1	50	1 cherry
floor	1322	1	10	
floor	1323	2	1	
floor	1326	1	20	
floor	1314			1 buckwheat/dock (uncharred)

Faunal Associations. The fauna recovered from House 1 is summarized later in Table 8.4. Included are elk, deer, fragments in the elk-bison and deer-mountain sheep size ranges, cottontails and jackrabbits, dog and dog family, woodrat, suckers, and several rodent species. Much of this bone is highly fragmented, both from intensive processing, and from preservation.

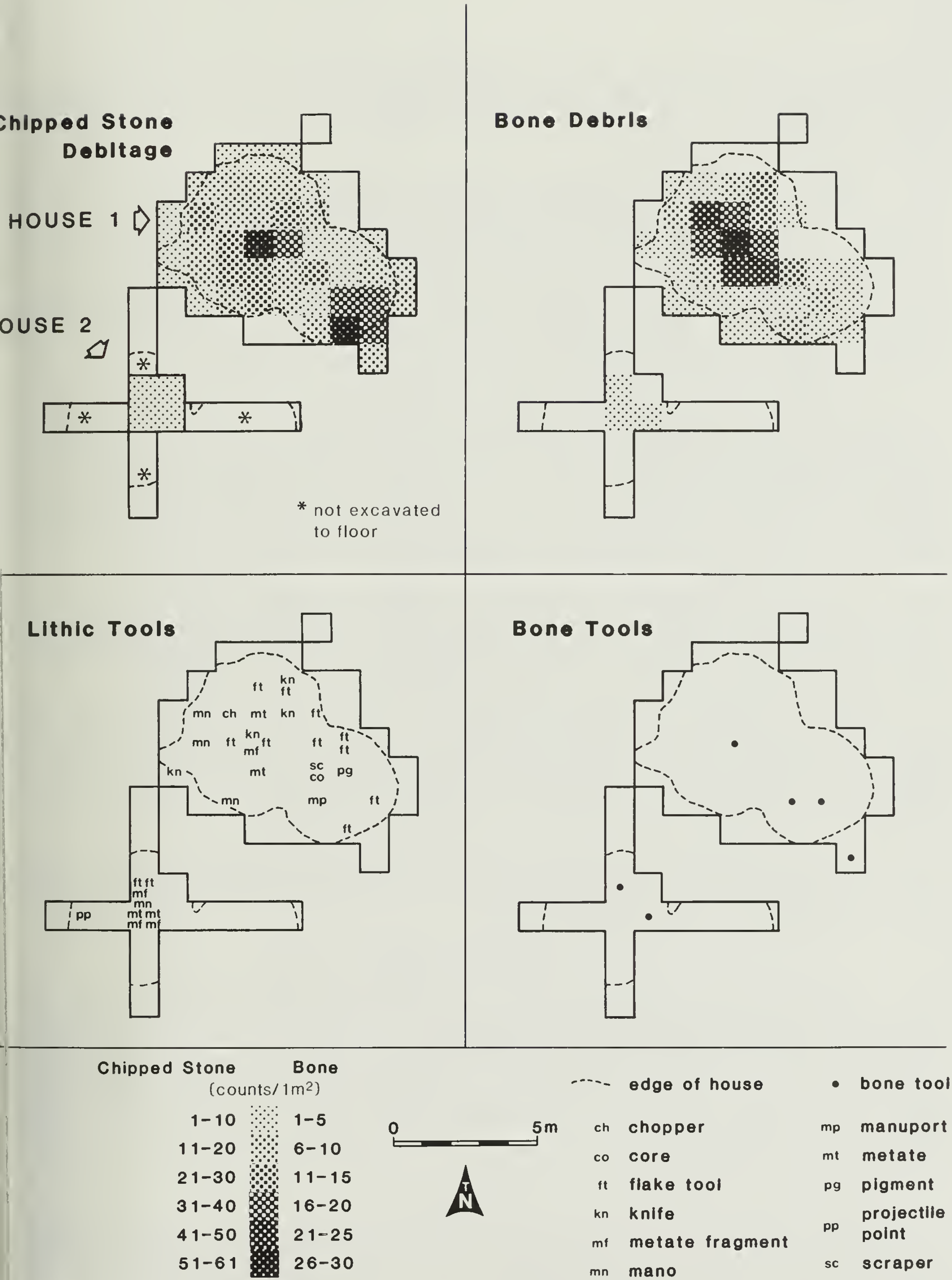
Activity Patterning. Use of space, both within and outside structures, is an interesting topic to pursue through mapping distributions of various functional categories of tools, features, and facilities. Doing so, however, requires a high level of understanding, on the part of the analyst, of the post-occupational processes that may have affected the distributions of cultural items. In the case of House 1, our excavation control is excellent in terms of both horizontal and vertical distributions of items. However, two processes limit the usefulness of this distributional data. One is the use of House 1 as a dump by the occupants of House 2, and the second is the colonization of the house fill by rodents and their burrowing predators. This has resulted in the introduction of later cultural material in close stratigraphic association with the house contents, and in a degree of subsequent mixing. Because the two occupations are closely spaced in time, and there is a high degree of continuity in artifact inventory, site function, and seasonality, this phenomenon is not a serious handicap to many lines of inquiry. It does, however, limit the usefulness of any fine-grained distributional patterning studies.

Nonetheless, distributional plots of the various artifact categories were done to assess the degree of mixing using such things as material types, conjoins of broken artifacts, and stylistic attributes of hafted bifaces. Stratigraphically, there is a peak in artifact densities about midway between modern ground surface and the house floor (50 to 65 cmbs) which most likely represents the trash accumulation zone from House 2. Beneath 65 cmbs, most of the material culture can most likely be attributed to the House 1 occupation.

In terms of activity patterning, it is justifiable, in this instance, to plot only items in direct contact with the floor, and even these may be out of their original depositional context. Figure 6.14 depicts the distributions of tools found on the floor, as well as showing flake and bone densities for contexts within a few centimeters of the floor level. Most of the apparent activity occurred near the feature clusters, with house perimeters showing less activity. Ground stone is more plentiful in the large house basin with large metates and metate fragments in the Feature 6 and Feature 10a areas, and with manos more scattered. Chipped stone tools cluster with the features in both houses, as does the faunal scrap. Lithic densities are highest in the lower basin of the large room and in an area to the southeast of the feature cluster in the small basin. This latter distribution is in the area hypothesized as the entryway.

House 2

A second structure, similar in general outline and material culture context, is situated just a few meters southwest of House 1. A test block, 2 m x 2 m, was excavated into the structure in 1987, as was a short backhoe trench that was dug as a precautionary measure prior to road construction. The original 2 m x 2 m block encountered artifacts and a fairly well-defined occupation



HOUSE FLOOR ARTIFACT DISTRIBUTIONS

FIGURE 6.14

surface, but no floor features of the type apparent in House 1 were found. A dip in the Unit 1 clay was noted in the backhoe trench, but the dip in the profile indicative of the house wall was obscured by moisture saturation at the time the trench was open.

Over the winter of 1987-88, artifact distribution plots and the depth and nature of the occupation surface indicated that another look at the area was needed. In 1988, the backhoe trench was reopened and a cross-trench of the house was excavated by hand. The wall of the house was readily visible in the now dry trench profile. The cross-trench was intended only as an exploratory measure to define the house shape, and excavations were terminated above the floor level. Only units 130-131N 96-97W have penetrated to the floor level of House 2, where collected charcoal yielded the date of 6080 BP.

In plan, the house appears to be of similar size and outline to House 1 (Figures 6.15, 6.16). The larger basin is projected to be 4.5 to 5.0 m in diameter, while the smaller is in the 3.5 m range. The large basin may be deeper than the smaller one, as in House 1. The larger basin appears to have been dug about ±60 cm below native surface. No definitive features were encountered during excavation of the 2 m x 2 m block. Rock clusters and stains showing up at this level may be indicative of nearby features or feature edges.

Artifact associations with this house include some 10 bifacial tools, 12 flake tools, and 24 ground stone items. Much of the artifactual material from the upper fill of House 1 also results from this occupation, especially the zone dated to 6030 BP. Chapter 7 covers these artifacts in more detail.

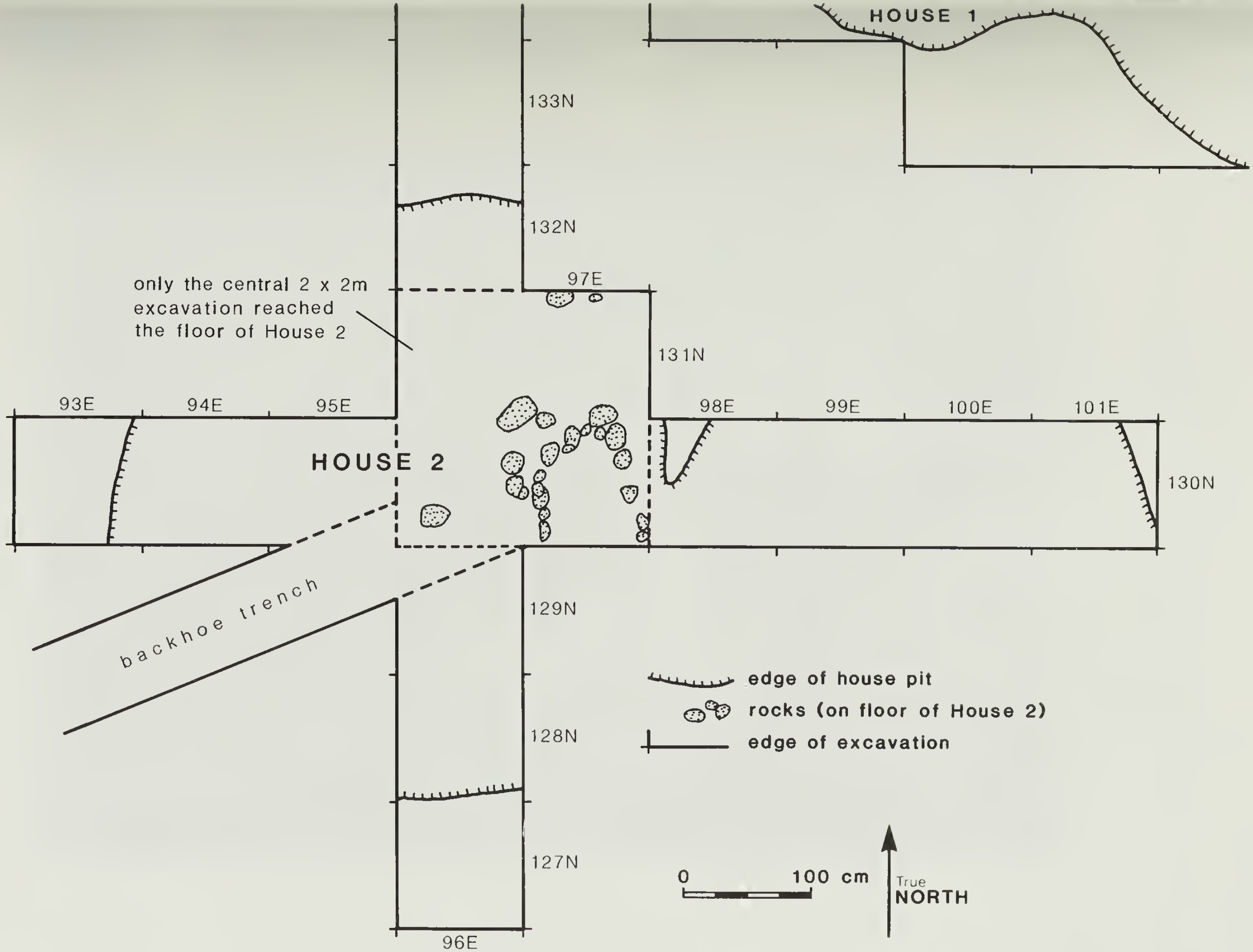
Faunal remains from House 2 include a similar range of species to those found in House 1, except there is a bison element in House 2, not present for sure in House 1, and, thus far, House 2 lacks cottontail and fish (see Chapter 8). This bone, like that associated with House 1, shows signs of intensive processing.

At this point, little else can be said concerning House 2. It is largely unexcavated and can, in the future, serve as a data source for hypotheses derived from the stages of work reported here.

Feature 14 Locus

Feature 14 was located during reconnaissance preceding the 1988 field season. Prior to excavation it appeared as a rock and artifact filled stain extending for a distance of about 6 m along the east bank of an erosional cut in the northeast area of the site. Testing of the feature was aimed at determining its nature and extent with the possibility in mind that it could represent another house structure. Testing included clean-up of the eroding face and about 15 m^2 of hand excavation. This has served to expose an estimated 35 to 40% of the feature.

In profile, the feature varies between about 15 cm and 35 cm in thickness, and dips to the north. In one profile, along the 151E line, there is a dip in Unit 1 soils similar to that observed in house profiles, but the stained, rock-filled feature matrix overrides this dip and continues several meters to the



PLAN, HOUSE 2

FIGURE 6.15

FIGURE 6.16

Walls of House 2 exposed in units along the 96E line. Northern and southern lips of the basin of the main house are marked with arrows. View is to the north.

south (Figure 6.17). Further, there is no discernible difference between the nature or content of the fill on either side of the dip.

Fill contents include finely divided charcoal and charcoal-stained dirt, ash, and hundreds of highly fractured cobbles of basalt. Mixed with this matrix are numerous highly fractured and sometimes fire-reddened pieces of manos and metates, lithic debris, tools, and faunal scrap. Flotation samples returned negative results; no pollen analysis was attempted.

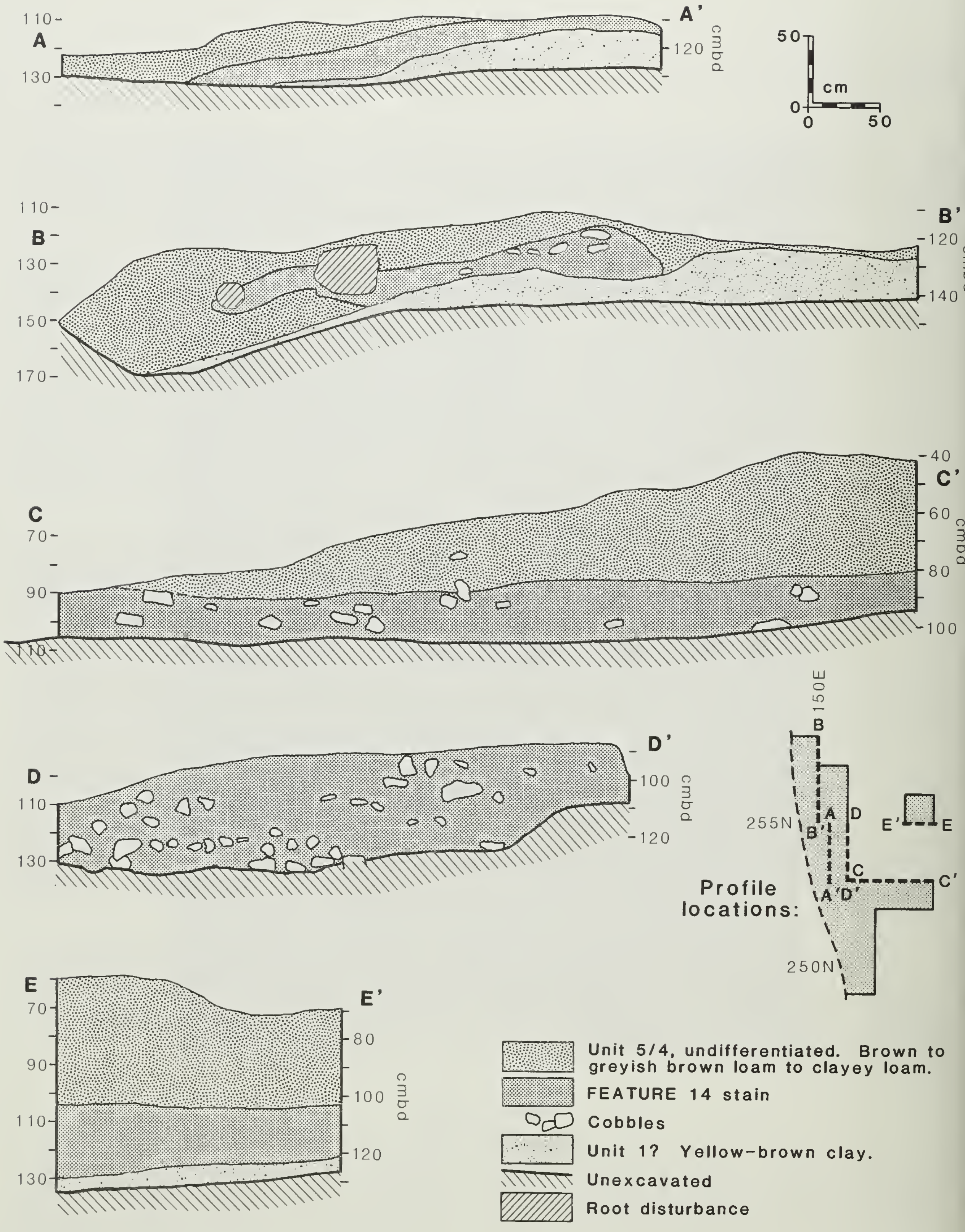
The deposit has the character of a large midden, with mixed burned rock and cultural debris, but it is possible that it is a feature with some large-scale processing or roasting function. Specific cultural items recovered here include a medium-sized side-notched projectile point that compares to the Mount Albion style, five other bifacially flaked tools, eight formal and expedient flake tools, 269 pieces of debitage, and 30 pieces of ground stone. Faunal remains include 45 bones which were mostly too fragmented for identification. Identified species include mule deer and jackrabbit. One fetal element, probably from bison, possibly of mountain sheep (see Chapter 8), was also identified. The character of the faunal scrap is indicative of intensive processing.

The feature returned a date of 4790 ± 70 BP (Beta-28131) from charcoal in the matrix. This date compares well with the date range for other Mount Albion components (Benedict 1978:134). The component has many similarities to earlier Archaic components at Yarmony including intensive faunal processing, use of local lithic resources, apparent cool season use, and use of numerous casually manufactured or expedient tools. Differences show up in the specific materials selected for use and in the relative proportions of flake types in the debitage assemblage (see Chapter 7). In the Feature 14 area, there was a greater reliance on igneous rocks (basalt, rhyolite) and siltstones, clear chalcedonies, and moss agate, and less reliance on local Miocene chert sources than is the case for the earlier Archaic occupations. Although all components show evidence of conservation of lithic raw material, flake sizes average larger around Feature 14, and core reduction flakes and reduction debris compose a higher percentage of the debitage sample. These differences may reflect cultural factors, but they more likely are functional differences resulting from outdoor versus indoor activities.

Testing of the Feature 14 activity area was, unfortunately, not as conclusive as was initially hoped. Our current interpretation is that it represents a midden associated with nearby processing and habitation areas. It is still possible, albeit unlikely, that yet another structure is present beneath this midden deposit.

Ceramic Locus

One of the initial significant aspects of the site was the presence of a style of pottery unusual for this area of the mountains. Several sherds of a light gray-brown pottery with an uneven, ripple-like surface treatment were found during recordation and testing. This surface treatment appears to be obliterated cord roughening. The sherds are more similar to High Plains examples of Plains Woodland pottery than they are to local micaceous tempered pottery



FEATURE 14 PROFILES

FIGURE 6.17

attributed to Utes or to any of the "Shoshonean" graywares common to the northwest.

In an effort to learn more about this occupation of the site, a block of 16 m^2 was excavated, and five scattered 1 m^2 tests also were dug in the vicinity. These excavations recovered additional sherds in Unit 5 soils as well as a few other artifacts, but no discernible activity areas or cultural features were located. A small corner-notched point with a lightly serrated blade was found on the surface near the site datum within the surface distribution of pottery. This point style is common in the early half of the Late Prehistoric period (1800 to 1000 BP) and is often associated with Plains Woodland occupations. The point may relate to the ceramic occupation. Likewise, the 1230 ± 60 BP date obtained from a soil stain stratigraphically above the small basin of House 1 may relate to this occupation.

Scattered Test Units

During initial testing, and again during the Colorado Mountain College work and 1988 field season, test units covering various portions of the site were excavated. These units were aimed at a better understanding of the nature and extent of subsurface cultural remains, as well as to aid in stratigraphic reconstruction of the site locale. In most areas where such testing proved fruitful, block excavations have occurred. Some cultural material, however, was retrieved from most test units (only one was completely sterile), and the testing at the site is still far from being exhaustive.

Several summary remarks are in order. The area south of the Trough Road yielded materials in thin, bouldery soils. These thin, rocky soils extend upslope 40 to 50 m from the road, beyond which are areas of deeper soil with visible cultural material on the surface. This area of deeper soils is untested.

East of the Pit House Locus, soils are thinner than in the house area, and some rill erosion is evident in test units. Cultural material is present, however, and there is some potential for later components and outdoor activity areas here.

West of House 2, Unit 127N 92E was very productive, especially below 35 cmbs, including abundant debitage, bone fragments, and a non-diagnostic point fragment. This area holds potential for occupations postdating the Early Archaic and for outdoor activity areas associated with the house occupations.

The test units north and west of the Pit House Locus have generally low artifact densities, but are of considerable future interest. There is a good, relatively undisturbed stratigraphic sequence, some cultural material and, in several units, there are some hints that additional features and structures may be present. Unit 148N 88E had low artifact densities, but just above 50 cmbs is a minor flake cluster, and beneath this is a mottled darkish gray to yellow-brown clay very similar to fill along the northern arc of House 1.

Unit 167N 75E also had low artifact yields, but several pieces of burned clay and oxidized pebbles were recovered in lower Unit 3 soils, again possibly indicating a nearby structure. Another test unit nearby, 160N 85E, had low

flake densities, but did have material in stratigraphic context in lower soil Unit 3.

Test units in the northern site area contain a dribble of cultural material. Those in the 200N vicinity have deep profiles, but had very little associated material. Unit 239N 99E was shallow and rocky, but did have a few flakes in its upper levels.

The test pits near Feature 14 are in an area where surface exposures of cultural remains occur. Some staining is also visible and the two units here, 242N 146E and 245N 146E, were aimed at determining if a feature was present. Flakes, along with one bone fragment, were recovered, as well as some stained and oxidized soil. The testing, however, did not confirm the presence of a feature, and the vicinity would benefit from additional testing.

CHAPTER 7

MATERIAL CULTURE

by Kevin D. Black, Michael D. Metcalf, Bret Overturf, Ronald J. Rood, and Minette C. Church

Introduction

Excavations at the Yarmony Site resulted in the recovery of an unusually diverse artifact assemblage compared with previously investigated open sites in the Colorado mountains. At least 12 general classes of artifacts are represented at the site and described below: chipped stone tools, chipped stone cores and debitage, ground stone, ceramics, construction daub, minerals, manuports, miscellaneous stone, bone tools, antler tools, and botanical specimens. Not included in this summation are non-tool faunal remains (including bones, antlers, teeth, and fat) which are discussed in Chapter 8, and miscellaneous remains identified in ancillary samples and reported elsewhere in this volume (macrofloral specimens, fossil pollen, and gastropods).

Through the 1988 field season, the artifact assemblage totals 4,606 items of which 331 are chipped stone tools, 4,077 are unmodified pieces of debitage, 140 are ground stone implements, 19 are potsherds, three pieces are of burned daub, five are mineral fragments, three are probably manuports, and 28 are of worked bone or antler. The analysis which follows covers three general topics - morphology, function and material type/source - with categories defined on the basis of morphology. Morphological categorization was complicated by the prevalence of reused items - often for purposes different from the original task which modified the form of tools - and this trend is present both in the Early Archaic and later Archaic/Late Prehistoric levels of the site.

Chipped Stone Tools

Core tools, bifacial and unifacial implements are grouped under this heading, which is the third largest set of artifacts present at the site, after chipped stone cores/debitage, and non-tool faunal remains. During investigations, 331 chipped stone tools were recovered, including eight cores and core tools, 200 flake tools, and 123 bifacially thinned artifacts.

Bifaces have been further broken down into two groups based on the presence or absence of haft elements then, within these groups, individual tool classes are defined morphologically using such factors as blade shape, edge sinuosity, edge angle and presence/absence of serrations. Hafted tools include projectile points, knives, saws, and awls or drills, of which many show secondary reuse and/or resharpening after blade breakage. Unhafted categories include blanks, preforms, knives, saws, scrapers, choppers, spokeshaves, burins and perforators; finer divisions also are possible, as perforators can include borers, drills, awls and gravers. Composite tools, as mentioned previously, are frequently

encountered in the assemblage both for unhafted and hafted bifaces. Knives are most notably used in combination with other functions and in at least one class (spokeshave-graver) the composite appears to be somewhat formalized.

Unifacial chipped stone tools in the Yarmony assemblage encompass many of the same classes as the bifaces, albeit the classification is organized differently. Four major groups of unifacial tools are defined based on the degree and symmetry of edge retouch and/or unifacial thinning: shaped, edged, minimally retouched, and utilized. Shaped flake tools are unifacially thinned artifacts of predetermined, stylized shape; edged tools are either thinned or unthinned flakes with retouch on one or more edges sufficient to alter the shape of the edge; and minimally retouched flake tools are unthinned implements either lacking edge retouch or exhibiting only incidental/minor edge retouch that does not substantially reshape the working edge(s). Utilized flakes exhibit no edge retouch and are defined by use wear.

Within these three categories the individual tool classes have been defined as for bifaces. They include non-utilized unifaces, knives, scrapers, choppers, wedges, spokeshaves, and perforators (drills, borers, gravers, etc.). Additional divisions are mandated by special functional or technological considerations. Blade tools can be used for many of the above tasks, but represent finer control by the flintknapper to achieve the high ratio of working edge-to-mass evidence in such tools. Microtools, mainly used for delicate scraping or incising, are diminutive flake tools that were probably too small to be used hand-held and, thus, may have been hafted in notched shaft. Resharpening flakes are not tools themselves, but retain evidence of the use of the tool from which they were removed.

Again, composite tools are numerous with perforators of various classes most often combined with other uses on adjacent edges - especially scrapers and spokeshaves. Many tools were backed for easier use by spalling off the edge(s) opposite the working surface via a blow directed transversely across (a snap break) or longitudinally along the edge (a burin-type break). Such backing is present both on unifacial and bifacial tools in the Yarmony assemblage, and was often done to rejuvenate broken edges of large tools for further hand-held use.

Core tools, and unmodified cores, constitute a relatively minor percentage of the chipped stone artifacts at Yarmony. However, morphological differences among those few tools are surprisingly great. Heavy scraper-planes, choppers, borers and wedges are included, and composite tools also occur among the cores.

Material Types

Material types represented in the Yarmony chipped stone tool assemblage are remarkably heterogeneous. The vast majority of the material is composed of varieties of a single tool stone locally known as Kremmling or Troublesome chert. Sources of this material are in extensive exposures of the Troublesome formation in Middle Park, as well as in the alluvial terrace gravels of the Colorado River. This same material also outcrops in patchy locations nearer to the Yarmony site but, as described in Chapter 3 of this report, geologists refer to these Troublesome-equivalent sediments west of the Gore Range as the Brown's Park formation (Tweto *et al.* 1978). After study of these materials in conjunction with Middle Park quarry sites, Miller (1989) has suggested the term Miocene chert

to encompass this broad range of material types. At Yarmony, variations from opaque to translucent, speckled and dendritic materials occur on individual flakes, cores and bifaces, demonstrating that these types derive from common source(s). In this report, opaque cryptocrystalline silicates are referred to as chert, translucent materials are called chalcedony, and nearly transparent specimens with or without dendritic or speckled inclusions are termed agate. Colors of this local material are gradations of light gray, light brown and white, with some nearly clear specimens also present and darker gray to brown varieties not uncommon. Dendritic and speckled inclusions in the specimens termed agate are black to greenish-gray or brown to reddish-brown in color. A waxy, usually white patina of varying thickness is present on many of these Miocene chert artifacts.

Much less frequent in the Yarmony assemblage, but still believed to be largely of local origin, are several other material types. One distinctive variety of dense, high-quality chert is gray-brown to chocolate brown with a waxy, smooth texture. This material is common in northwestern Colorado where it is called Brown's Park chert and, as noted above, the occurrence of the Brown's Park formation in the vicinity of the Yarmony site suggests this chert was procured locally. Another material common in northwestern Colorado and present in smaller amounts at Yarmony is a translucent, dark brown chalcedony that bears a striking resemblance to "Knife River Flint," a northern plains material type. However, the local variety is known to outcrop in the southern Washakie Basin in Wyoming and Colorado, and is believed to derive from the Laney member of the Green River formation. In this report, therefore, the material is referred to as Laney chalcedony.

A material present in the F-14 locus at Yarmony is moss agate, believed to occur locally in river pebbles. It is also a common material at the nearby Radium site (Metcalf n.d.).

Also represented in the Yarmony assemblage are small amounts of dark-colored igneous materials in banded and speckled varieties. Most are in shades of gray grading to black. A few flakes classified as siltstone and shale also occur in these same dark colors, and flakes of suspected petrified wood are present in shades of brown. All are suspected to be of local origin and their low percentages are believed merely to be a reflection of their inferior flaking qualities. Finally, some miscellaneous cherts are present that cannot be lumped into any of the above categories with any degree of confidence; a few of these may be of non-local origin. Brighter shades of orange, red and yellow are included, and some coarse-grained varieties occur as well.

<u>Hafted Bifaces</u>

This category includes all bifacially thinned artifacts with proximal modifications for hafting on a handle or other shaft. A total of 36 items comprises this class. The majority are variants of the stemmed-indented base points common in the western United States. Those from Yarmony are considered within the Little Lake series (Pinto type) rather than the McKean complex (Duncan-Hanna types) based on the associated Early Archaic period radiocarbon dates. In fact virtually all of the specimens at Yarmony fit the chronological and morphological definitions for types defined in the Great Basin. It should be emphasized, however, that chronological sequences for some of these "Great

Basin" types are best represented in rock shelter sites of the northern Colorado Plateau, to the east of the Great Basin physiographic province (e.g., Jennings *et al.* 1980; Holmer 1986) and adjacent to the Southern Rockies.

Holmer (1986:112) points out that the widespread distribution of individual types such as Pinto can be explained merely by information flow rather than long-distance travel, and the Yarmony site supports that notion. Thus, we need not have "Great Basin" Indian groups wandering east into the mountains to winter at Yarmony; the predominance of local material types clearly suggests that inhabitants were indigenous to the Yarmony area. Rather, the present of large numbers of Pinto points at Yarmony is better explained as evidence that the Southern Rocky Mountains were within the range of a communication network that extended westward into the northern Colorado Plateau and eastern Great Basin areas. Previously, one of us (Black 1986) has posited a Great Basin origin for some Archaic inhabitants of the Southern Rockies, and the above discussion should not be taken to be a refutation of that hypothesis. Since the Yarmony pit houses were occupied no earlier than 6300 BP, the site is at least 3000 years younger than the postulated time of expansion by Great Basin groups into the Colorado mountains. That Yarmony was within the communication/information network which included the eastern Great Basin at 6300 to 6000 BP supports in its own small way the "Mountain Tradition" construct's implication of a Great Basin ancestry.

One striking aspect of the Yarmony hafted bifaces is the degree of reuse of broken specimens, especially through backing via snap or burin-type fractures in order to reorient the tool function toward use of basal projections and notches. This pattern is most frequent on the stemmed-indented base forms, and occurs both in Early Archaic and Late Prehistoric contexts. In the latter cases, it would appear that some "quarrying" of Early Archaic materials was done by later inhabitants for reuse of larger discarded specimens. Illustrations of representative specimens (indicated with an asterisk) are provided in Figures 7.1, 7.2, and 7.3.

<u>Type 1: Small corner-notched with serrated blade (N=1)</u>

Provenience: surface, near site datum
Catalog No.: 5EA799.1509*
Blade Form: triangular
Fracture: blade tip, one shoulder tip and base broken
Material: Miocene chert
Hafting Modification: probably corner-notched
Context: none
Blade Edges: slightly convex, finely serrated
Shoulders: oblique
Tip: impact-fractured
Haft Element Shape: unknown, broken
Retouch: finely executed along blade edges
Resharpened: no
Utilized: no
Flaking Pattern: collateral
Cross-Section: lenticular
Measurements: maximum length = 20.3 mm; width = 13.8 mm; thickness = 2.3 mm; neck width = 7.1 mm (approx.)
Similarities to Named Types: Hogback, Parker, Ruby, Rose Spring

References: Nelson (1971), Buckles (1973), Benedict (1975a), Holmer and Weder (1980), O'Neil (1980), Reeves (1983), Rossillon (1984), Black (1986)
Illustration: Figure 7.1a
Function: arrow point
Age/Affiliation: ca. 1800 to 1000 BP, possible association with Yarmony date of 1230 ± 60 BP/undefined post-Archaic
Discussion: Although the base of this specimen is broken, remnant notches and the oblique shoulders indicate this is a small corner-notched type. In general, small corner-notched points are very common in the Colorado mountains with excavated specimens most often dated to the period 1800 to 1000 BP. Recently, however, earlier C-14 ages as old as 3000 to 2500 BP have been returned for this and other arrow point styles, suggesting more ancient experimentation with bow-and-arrow technology than is generally accepted. A good example is the Kewclaw Site near Parachute, Colorado where small corner-notched points and a pit house were dated to 2900 to 2500 BP (Conner and Langdon 1983). The aboriginal component at the McPhee Homestead just east of Yarmony also yielded a small corner-notched point near a feature with a C-14 age of about 2100 BP. Fine serrations characterize the blade edges of the Yarmony specimen, and such serrations become increasingly frequent on points as one moves farther east in the Colorado mountains. For the most part, the serrated points in the eastern mountains and foothills are ascribed to the "Hogback phase" of Plains Woodland affiliation (e.g., Benedict 1975a, 1975b; cf. Butler 1986), whereas the usually unserrated type(s) with somewhat narrower blades are called Rose Spring points (Holmer and Weder 1980); these two types are contemporaneous. However, the Yarmony example is relatively thinner and more delicate than the above two types and, given its undated surface provenience, a post-1000 BP age for this artifact cannot be ruled out.

Type 2: Medium corner-notched (N=2)

Proveniences: 134N/100E, 5-10 cmbs and 135N/100E, 100-105 cmbs
Catalog Nos.: 5EA799.19* and .21*
Blade Form: triangular
Fracture: blade and base partially broken on both
Material: Miocene chert (2)
Hafting Modification: corner-notched, notch width and depth variable
Cortex: none
Blade Edges: irregular, crudely serrated on #21
Shoulders: abrupt to slightly oblique
Tip: both broken, impact-fractured on #19
Haft Element Shape: stem edges = expanding, broken on #21, base = convex, broken on #21, notches = medium-shallow (#19) to broad-deep (#21)
Retouch: extends across blade on both specimens
Resharpened: no
Utilized: no
Flaking Pattern: chevron (#19) and collateral (#21)
Cross-Section: lenticular (#19) to biconvex (#21)
Measurements: maximum length = 19.7-22.7 mm (blade, both broken) and 2.1-5.0 mm (stem, #21 broken); width = 19.8-20.7 mm (blade, #19 broken) and 11.5-12.9 mm (stem, both broken); thickness = 4.5-5.4 mm; neck width = 11.1-12.99 mm
Similarities to Named Types: Elko
References: Holmer (1986), Hand and Gooding (1980), Black (1986)

HAFTED BIFACES

FIGURE 7.1

Illustration: Figure 7.1b,c
Function(s): projectile point; serrations on #21 suggest a hafted knife but no use-wear evident
Age/Affiliation: Mountain Tradition Archaic, 6300 to 2000 BP
Discussion: Crudely flaked corner-notched points are widespread over a large area of the Rocky Mountains and surrounding regions, and are known by a number of names. Many are found in Late Archaic period contexts, but this style should not be confused with the Pelican Lake type - a well-made, very symmetrical point with sharply oblique shoulders (Reeves 1983). The exception to the Late Archaic period dominance of the style is in the eastern Great Basin-northern Colorado Plateau area where Holmer (1986:101-104) notes the occurrence of Elko corner-notched points in the three flourits at 7600 to 6200 BP, 5000 to 3400 BP and 1800 to 1000 BP. The best dated local example is the Dotsero Burial at the Eagle-Colorado River confluence where two corner-notched points found with the burial have an associated date of ca. 2900 BP (Hand and Gooding 1980). At Yarmony the two specimens occur in widely separated contexts: one in the lower fill of Pit House 1 which should date it to 6300 to 6000 BP, and the second from a very shallow buried context in Soil Unit 5 suggesting a Late Prehistoric age of less than 1200 BP. However, as mentioned previously, the Late Prehistoric period inhabitants of the site "quarried" the area for previously discarded materials, and we suggest this as a possibility to explain the provenience of specimen #21, for which an Archaic period age of more than 2000 years seems appropriate.

<u>Type 3: Large side-notched with concave base (N=1)</u>

Provenience: surface, 19m @ 351° from site datum
Catalog No.: 5EA799.2*
Blade Form: broken
Fracture: most of blade, one shoulder and one base corner broken
Material: tan and orange-brown banded chert
Hafting Modification: side-notched, base <u>not</u> ground
Cortex: none
Blade Edges: broken
Shoulders: sloping
Tip: broken
Haft Element Shape: stem edges = slightly contracting, base = concave, arcing 2.1 mm above base corners, notches = broad, deep, U-shaped
Retouch: well-executed on preserved base fragment
Resharpened: no
Utilized: unknown
Flaking Pattern: uncertain, appears to be collateral
Cross-Section: biconvex
Measurements: maximum length = 6.9 mm (blade-broken) and 11.88 mm (stem and neck-complete); width = 21.9 mm (blade-nearly complete) and 18.7 mm (stem-complete); thickness = 6.0 mm; neck width = 15.1 mm
Similarities to Named Types: Pahaska, Northern Side-Notched
References: Husted and Edgar (n.d.:Plates 14&18); Frison (1983); Holmer (1986)
Illustration: Figure 7.1d
Function(s): projectile point
Age/Affiliation: possibly 7050 BP/undetermined Early Archaic complex
Discussion: This surface specimen is made of an unusual variety of chert not seen in the lithics excavated from the pit houses. The suggestion that this

artifact may derive from the initial occupation of the site at 7050 BP is based on the discovery of a scraper from the bison processing area, also made from an unusual lithic material type. Chronologically, the Yarmony specimen compares favorably with Plains and Basin-Plateau types dated to ca. 7200 to 4400 BP. The Northern Side-notched type (Holmer 1986) is most common around 6900 to 6300 BP on the northern Colorado Plateau, and the style survives in later contexts farther north and west. Northwestern Plains types like Pahaska Side-notched have been dated to 6780 to 4640 BP at Mummy Cave, Wyoming (Husted and Edgar n.d.). Locally, large side-notched points are infrequent but widespread in the Colorado mountains (e.g., Benedict 1981; Gooding 1981; Black 1986). Most of these examples, however, have straight to convex basal edges, not concave like the Yarmony specimen. If the point from Yarmony is associated with the component dated to 7050 BP, a High Plains cultural affiliation might be more appropriate given the presence of butchered bison bone in that activity area.

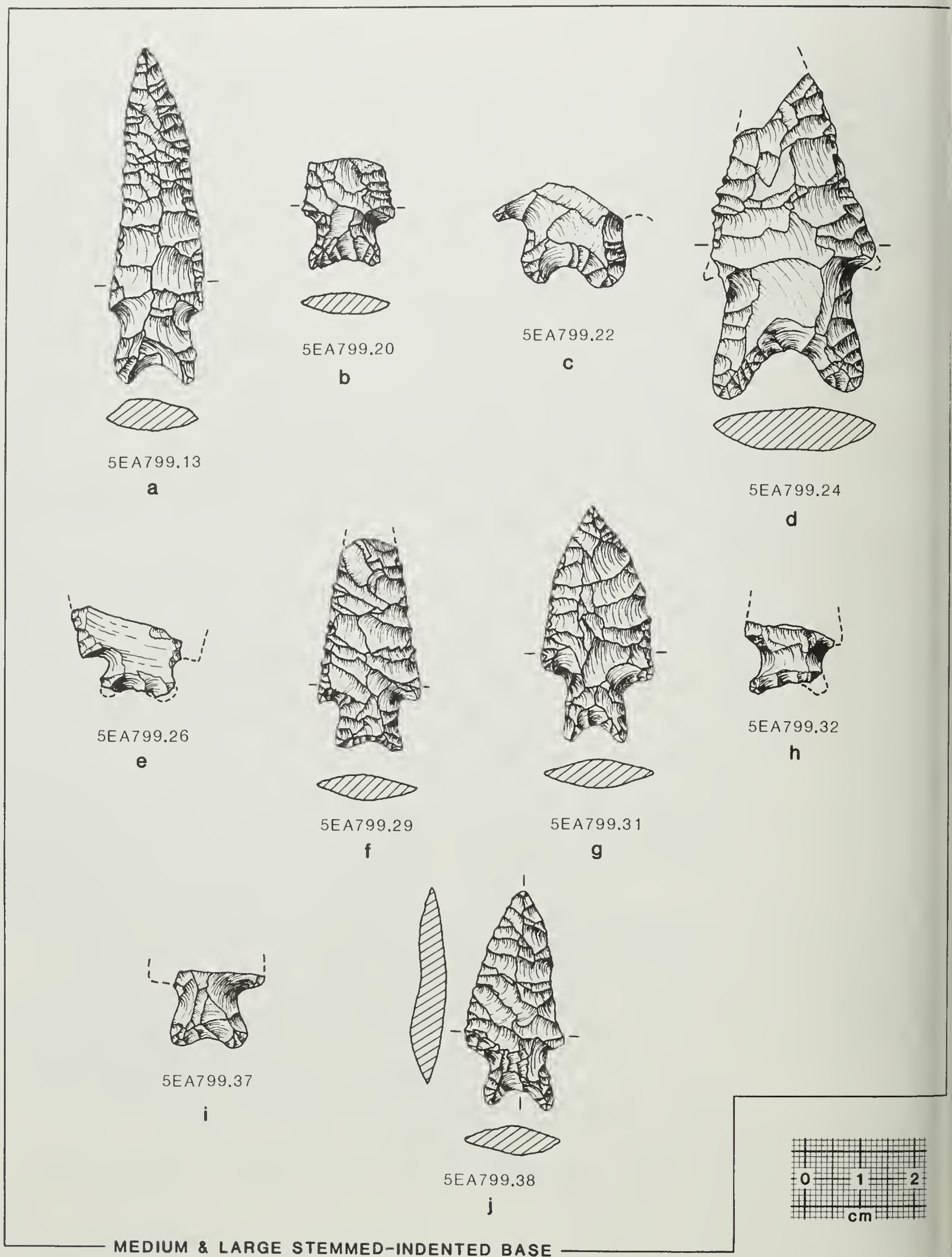
Type 4: Slender triangular points with small, bifurcated stems (N=2)

Provenience: 138N/100E @ 40 to 45 cmbs and 131 N/97E @ 55 to 60 cmbs
Catalog Nos.: 5EA799.30* and .34*
Blade Form: narrow, subtriangular
Fracture: one base corner broken on .30; most of base and blade tip broken on .34
Material: Miocene chert .30; and dark gray chert .34
Hafting Modification: small bifurcated stem; uncertain on .34
Cortex: none
Blade Edges: straight, finely serrated on .34
Shoulders: slightly oblique
Tip: very sharp on .30; extremity broken on .34
Haft Element Shape: (.30 only), stem edges = straight, base = deeply indented (2.6 mm), unground, basal corners = sharp
Retouch: well-executed, especially on .34
Resharpened: no
Utilized: light edge wear on one blade edge of each specimen, wear near tip on .34
Flaking Pattern: collateral
Cross-section: biconvex, .30 slightly asymmetrical
Measurements: maximum length = 30.9 to 42.2 mm (blade, shorter length of .34 nearly complete) and 5.1 mm (stem, .34 broken); width = 16.4 to 16.5 mm (blade) and 7.8 mm (stem, .30 nearly complete); thickness = 4.4 to 5.3 mm; neck width - 7.6 to 9.4 mm; mass = 1 to 3 gm (.30 nearly complete)
Similarities to Named Types: Gatecliff Split Stem
References: Thomas *et al.* (1983); Holmer (1986)
Illustration: Figure 7.1e,f
Function(s): knife, .34 possibly a borer
Age/Affiliation: ca. 6300 to 3000 BP/Mountain Tradition Archaic
Discussion: Specimen .30 is of classic Gatecliff Split Stem style, while .34 is placed in this type on less certain grounds based on blade form and its relatively narrow neck width. Neither artifact shows evidence of use as a projectile point, although such a function cannot be ruled out given such a small sample size. Gatecliff points are certainly rare in Colorado; no comparable examples could be found in our search of the literature, and Holmer (1986:Figure 9) maps their distribution in the central and northern Great Basin. At the type site in Nevada (Thomas *et al.* 1983:Figure 82) the Gatecliff Split

Stem type occurs almost exclusively in cultural horizons 8 and 9 dated to 3660 to 2895 BP. Holmer's (1986:96-99) synthesis extends the time frame throughout that region to 4500 to 3000 BP. At Yarmony, however, the two excavated specimens occur in Early Archaic contexts. In light of the rarity of this type in the Colorado mountains, it may be best to reserve judgment on the chronological implications of the finds at Yarmony pending further investigations. Alternatively, these two specimens may represent no more than extreme stylistic variation in the "Pinto" type more characteristic in the Yarmony assemblage.

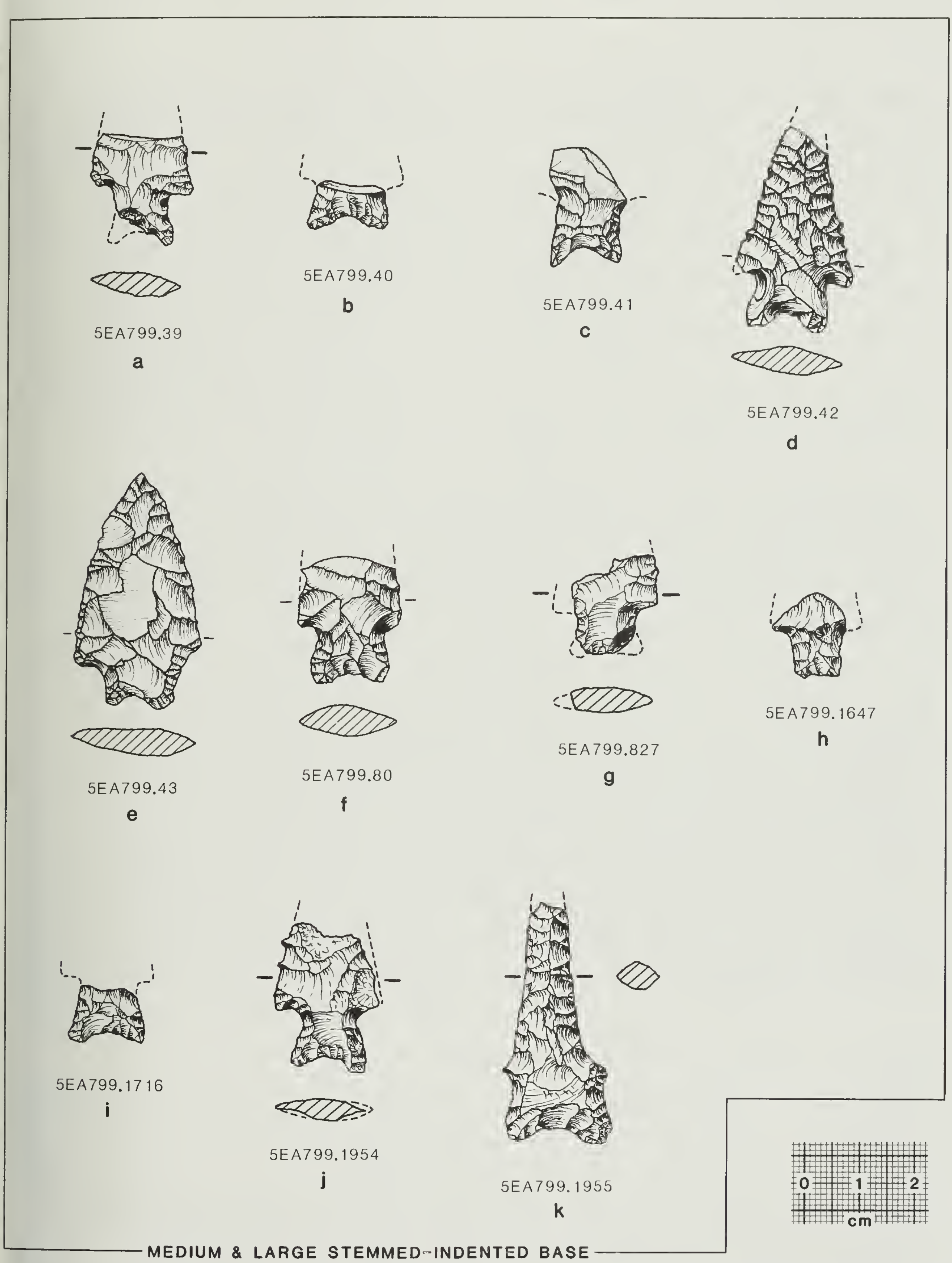
Type 5: Medium to large stemmed-indented base points (N=28)

Provenience: widespread throughout pit house locus at 5 to 95 cmbs
Catalog Nos.: 5EA799.13*, .20*, .22*, .23, .24*, .26*, .27, .29*, .31*, .32*, .36, .37*, .38*, .39*, .40*, .41*, .42*, .43*, .80*, .495, .827*, .1511, .1612, .1647*, .1716*, .1864, .1954*, .1955*
Blade Form: subtriangular to lanceolate; most are incomplete
Fracture: mostly incomplete; seven are nearly complete to complete
Material: light gray to dark gray local chert (N=10); maroon-brown chert (N=1); banded brown coarse-grained quartzite (N=1); black chert or fine-grained igneous with tan intrusive veins (N=1)
Hafting Modification: stemmed-indented base
Cortex: none
Blade Edges:unknown/broken = 13; straight = 9; convex = 2; asymmetrical = 2; finely to coarsely serrated = 9
Shoulders: abrupt = 11; oblique = 7; unknown/broken = 6; sloping = 4
Tip: sharp = 3; very sharp = 1; unknown/broken = 24; impact fractures = 0
Haft Element Shape: stem edges = expanding (17), convex (3), straight (2), contracting (1), broken (6), ground (4); base = indented (17), concave (5), broken (6)
Retouch: generally well executed
Resharpened: blade or tip edges reworked = 4
Utilized: use-wear on blade edges = 10; unknown/broken = 8; no use-wear = 4; base corner reused as perforator = 3; shoulder tip reused as perforator = 1; shoulder tip and base corner reused as perforators = 1; shoulder tip and adjacent concavity at neck reused as composite graver-spokeshave = 1; awl/drill = 2
Flaking Pattern: collateral = 13; oblique to parallel oblique = 2; broken/ unknown = 13; original flake scar visible = 4
Cross-section: biconvex = 20; asymmetrical biconvex = 1; lenticular = 3; broken/unknown = 4
Measurements: maximum length = 28.5 to 46.9 mm range, 35.8 mm average (blade, N=4), 6.5 to 23.0 mm range, 10.5 average (stem, N=17; maximum blade width = 14.0 to 29.6 mm range, 19.8 mm average (N=13); maximum thickness = 3.9 to 8.55 mm range, 5.5 mm average (N=21); neck width = 8.2 to 21.88 mm range, 11.7 mm average (N=22); depth of basal indentation/concavity = 1.2 to 8.33 mm range, 2.77 mm average (N=16)
Similarities to Named Types: Pinto Shouldered
References: Amsden (1935); Harrington (1957); Green (1975); Jennings *et al.* (1980); Holmer (1978, 1986)
Illustration: Figures 7.2, 7.3
Function(s): projectile point, drill/awl, knife/saw, reused as perforators and gravers
Age/Affiliation: 6300 to 6000 BP/Mountain Tradition Archaic



HAFTED BIFACES

FIGURE 7.2



HAFTED BIFACES

FIGURE 7.3

Discussion: The large sample of these artifacts from Yarmony exceeds that from any other site in Colorado and, thus, provides important information on the range of variation within Pinto-like types. This assemblage also suggests that the eastern boundary of the type may extend farther east into the Colorado mountains than was previously thought. There is some morphological overlap with the Duncan-Hanna type series of the McKean complex, but the Early Archaic age of the Yarmony specimens, their rounded basal corners and the commonly serrated blade edges clearly distinguish them from the Middle Archaic period types. Benedict (1990:26) reports two stemmed-indented bases from the Coney Lake Site in the Front Range that date to about 5700 BP which he believes to be ancestral McKean. Pinto points are occasionally found on surveys in the Colorado mountains (e.g., Black *et al.* 1981:65-66), and one was recovered from an excavated context dated to ca. 6100 BP in the Curecanti Basin (Stiger 1981:40). The type is common in both the eastern Great Basin and northern Colorado Plateau portions of Utah, where Holmer (1986:96-99) notes they date to 8300 to 6200 BP at such sites as Danger Cave, Hogup Cave, Sudden Shelter and Deluge Shelter.

Surface finds from the type locality (Amsden 1935) and other sites in the western Great Basin (e.g., Harrington 1957) are thus far undated, and also appear to be more crudely flake then those from eastern areas. Green (1975) maintained there is a technological distinction in the Great Basin vs. Plains stemmed-indented base forms, especially in flake patterns with parallel-oblique flaking more prevalent in the Great Basin. However, the Yarmony specimens include only two obliquely flaked artifacts.

Three other artifacts placed in the Pinto category are somewhat unusual and deserve further mention. Specimen 24 is an exceptionally large, coarsely serrated knife, probably associated with the second pit house occupation. Although its dimensions far exceed those of any other hafted biface in the assemblage, its outline form matches the Pinto type and, thus, it simply represents a larger tool of the style suitable for heavy-duty cutting or sawing. Specimen .43 is unusual in having a contracting, rather than expanding or bulbous, stem. Also, it is somewhat thinner than other Pinto specimens at Yarmony. Contracting stem points are included in the Gatecliff series of Middle to Late Archaic age by Thomas (1983) and Holmer (1986), but the Yarmony artifact fits neither the split-stem nor contracting stem (a.k.a. Gypsum) types in the Gatecliff series. Unfortunately, the Yarmony specimen is from an uncertain vertical provenience in Soil Units 2 or 3, so its chronological placement is not known. Specimens .1864 and .1955 have been reworked into an awl or drill (Figure 7.3k).

Type 6: Large side-notched, convex base

Provenience: Feature 14
Catalog No.: 5EA799.1876 and .1879*
Blade Form: lanceolate
Fracture: mid-notch on .1876; mid-blade on .1879
Material: light gray chert (Troublesome Formation)
Hafting Modification: shallow side to corner ground notches, ground base
Cortex: on .1876, none; on .1879, slight cortex on haft element
Blade Edges: on .1876, missing; on .1879, straight
Shoulders: abrupt
Tip: missing

Haft Element Shape: shallow side corner notches, rounded basal corners, convex to rounded base
Retouch: well executed
Resharpened: no
Utilized: light edge wear on .1879
Flaking Pattern: collateral; almost parallel on .1879
Cross-section: thin biconvex
Measurements: maximum length = unknown; width = 26.7 mm (.1879); thickness = .8 mm (.1876), 9.9 mm (.1879): neck width = 19 mm (.1876), 21 mm (.1879); stem length = 11 mm (.1876), 14 mm (.1879)
Similarities to Named Types: Mount Albion Corner Notched
References: Benedict and Olsen (1978); Gooding (1981); Liestman (1984)
Illustration: Figure 7.1g
Function(s): projectile points
Age/Affiliation: within matrix of Feature 14 dating to 4790 ± 70 (Beta-28131)
Discussion: Both specimens fit well within the descriptive range of the Mount Albion corner-notched type as defined by Benedict (1978) for the Hungry Whistler site in the Front Range, but also are comparable to a similar corner-notched form found at the Ptarmigan site, also in the Front Range (Benedict 1981). Benedict (1981:114) compares the Ptarmigan specimens to Archaic sites postdating the Mount Albion Complex such as Dipper Gap (Metcalf 1974), Spring Gulch (Kainer 1976), Magic Mountain (Irwin and Irwin-Williams 1966), and others. Benedict contrasts the Ptarmigan sample from Hungry Whistler (the Mount Albion type site) on the basis of less emphasis on notch and basal grinding at Ptarmigan, although he does see the Ptarmigan points as possible derivatives of Mount Albion points. Other local mountain sites with similar side- to corner-notched convex based points include Vail Pass (Gooding 1981) and Pontiac Pit (Liestman 1984).

Dates for the Mount Albion Complex begin at 5800 ± 125 BP at Hungry Whistler (Benedict and Olsen 1978:134). An ending date prior to 4800 BP is apparently found by Benedict based on excluding the Ptarmigan materials with dates of 4795 ± 95 BP (I-8280), 4700 ± 95 (I-8563) and 4620 ± 95 (I-8562) (ibid.) In view of stylistic continuity and the similarity in dates between Ptarmigan, Pontiac Pit (4710 ± 120 BP; Liestman 1984:24) and Yarmony (4790 ± 70 BP), it appears justified to extend Mount Albion to encompass these sites. As Benedict has pointed out (1978:135), a terminal date for Mount Albion depends upon where one draws a line across a continuum. At Yarmony, similarities in apparent adaptive strategy exist between the F-14 component and earlier ones, and there is a long hiatus following that occupation. That, and the similarity in dates cited above lead us to include Ptarmigan, Pontiac Pit and Feature 14 locus at Yarmony within the Early Plains Archaic (Metcalf and Black 1988b).

This does raise a question, however, in that it extends a period traditionally held to be equivalent in time to the Altithermal (e.g., Gooding 1981) beyond the time range for this event. Aspects of chronology, paleoclimate, and mountain cultural dynamics are further explored in Chapter 9.

<u>Unhafted Bifaces</u>

This category includes the 87 bifacially thinned artifacts, including blade fragments, that lack clear evidence of haft elements. Several of the blade and tip fragments included here are quite likely from hafted tools, but most are not. Unhafted bifaces were classified according to production stage,

edge angle and configuration, use-wear, and gross morphological characteristics into 12 functional classes as described below. The variety of functional classes is testimony to the many uses and re-uses of tools that occurred at Yarmony.

Most of the biface assemblage, both unhafted and hafted, derive from Early Archaic use of the Pit House Locus. Some 51% (63) of all bifaces and 47% (41) of unhafted bifaces are from pit house proveniences, and another 33% (41) of all bifaces and 37% (32) of unhafted bifaces overlie house structures in later age Unit 4 and 5 soil zones. Most of the hafted bifaces over the house structures are of the Early Archaic styles represented in the houses, and thus probably derive from mixing rather than from later occupations. It can therefore be inferred that most artifacts that overlie the houses derive from the Early Archaic occupations. Charcoal from a stain in lower Unit 5 over House 1 dated to ± 1230 BP, however, so at least some of the material over the pit houses relates to later occupations. As noted earlier in this chapter, re-use of Early Archaic tools by late occupants occurred in this locus as well.

Outside of the pit house locality, five unhafted and two hafted bifaces are from F-14, and six unhafted and one hafted bifaces are from the Ceramic Locus. The remaining bifaces are from scattered proveniences.

Four production stages were used as part of the classification process. Stage 1 are the most crudely shaped and are only initially thinned past the raw nodule/core stage. Stage 2 bifaces are further thinned and have a symmetrical outline, but are not further retouched. Stage 3 are narrower, better thinned, symmetrical in outline, and show some retouch in addition to gross thinning flake scars. Stage 4 includes finished bifaces and bifaces that are symmetrical, have thin cross-sections, and have regular, non-sinuous edges.

Only two Stage 1 bifaces were found, one from F-14, and one in a Late Prehistoric context north of House 1. Both are unutilized blanks. Stage 2 bifaces include nine tools, all from the Pit House Locus. Four are in definite association with houses; one is from Unit 4 soils, and four are in Late Prehistoric-age Unit 5. One is characterized as a blank, one as a knife/chopper, one as a chopper, and six as bifacial scrapers.

Stage 3 tools are more common (n=21) and include more variety in function. Six are unutilized preforms; the remainder have a variety of functions. Stage 4 unhafted bifaces include 10 unutilized preforms and 45 utilized tools. Most are from the Pit House Locus, but three are from Feature 14 and four are from the Ceramic Locus.

The low number of early stage blanks and the paucity of cores relative to the number of utilized late-stage bifaces at Yarmony is one of the lines of evidence to suggest a winter occupation. Table 7.8 (at end of chapter) shows that the unhafted bifaces are dominated by local material types that are available within 6 to 8 km of the site. One would expect, from the proximity of such quarries and the long-term occupation obviously represented, that greater amounts of initially reduced cores and blanks would be present at Yarmony. The fact that such artifacts are rare argues for conservation of raw material and full reduction of materials on hand - we believe due to limited access to the quarries caused by winter snowpack. The high incidence of reuse in bifacial and

other tool classes also supports this notion. A more detailed treatment of the evidence for winter occupation of the pit houses is provided in Chapter 10.

Functional classes for unhafted bifaces were assigned on the bases of edge shapes, edge angles, and type of use-wear visible under 10x magnification. In some cases, the class assigned to a tool represents the end or final use of a tool which has been used for several purposes over its use life. Functional classes are described below, and summarized in Table 7.8.

Blanks (Figure 7.4a). The three tools in this class are unutilized Stage 1 and Stage 2 bifaces. All are complete or nearly complete. They are minimally thinned, early stage-of-manufacture artifacts of locally available raw material. None are from pit house proveniences.

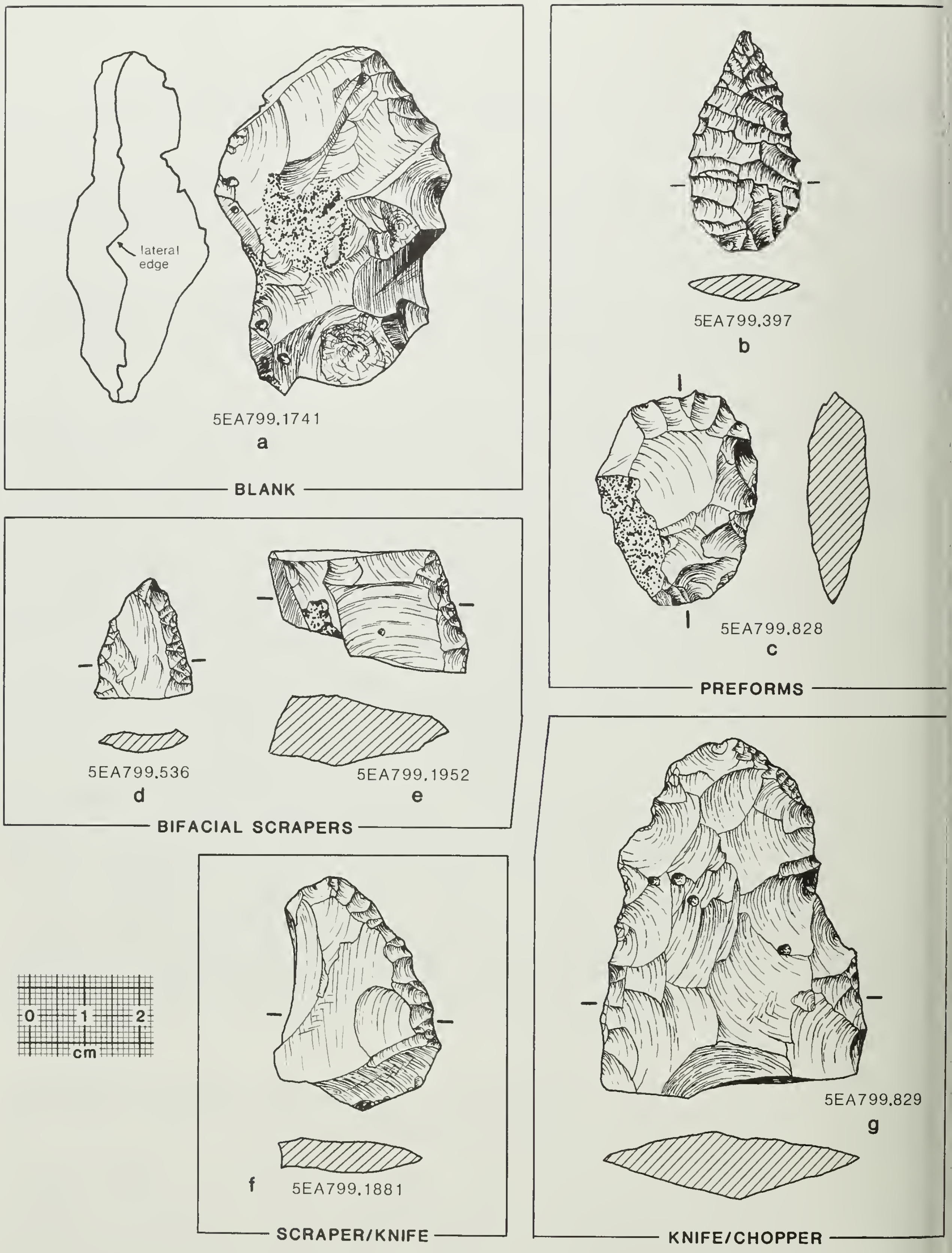
Preforms (Figure 7.4b,c). This class includes six Stage 3 and ten Stage 4 bifaces. They are distinguished from finished tools by having less complete retouch and by a lack of visible use-wear on blade edges. Only three specimens are complete. Tools in the class are mainly fragments broken during the middle to late stages of manufacture. The size range of tools in this class is difficult to characterize because of the fragmentary nature of most specimens, and because of the variety in sizes in the original tools. Complete or nearly complete specimens vary from 37.4 to 43.5 mm in length, 20.2 to 32.44 mm in width, and 4.9 to 12.5 mm in thickness. The average thickness of complete specimens is 8 mm, while that of all specimens is only 5.5 mm. This perhaps indicates a trend of increased breakage as a greater degree of bifacial thinning occurs.

As is the case with blanks, local materials are exclusively represented, 15 of Miocene cherts, and one of moss agate. Most of these tools are from the Pit House Locus, eight from house proveniences, and an additional five from overlying soils.

Bifacial Scrapers (Figure 7.4d,e). The tools grouped in this category display edge angles of 45° or greater and edge wear indicative of a scraping motion. This includes step fractures, edge rounding, edge crushing, and attrition. Most edges have angles of 50° or greater. Those with edge angles in the 45 to 50° range overlap the range for knives, and assignment to one or another class was judgmental. Edge shape variations include irregular, straight, concave, and convex forms. Stage 2 (six), Stage 3 (four), and Stage 4 (two) tools are represented, but mid-stage bifaces are predominant in the class. Complete tool sizes are 43.7 and 62.4 mm in length, 30.2 and 32.7 mm in width, and 10.7 and 17.1 in thickness. The average thickness of these two of 13.9 is greater than the 10.99 mm for all bifacial scrapers.

Once again, local materials compose 100% of the class as follows: Miocene chert - 9; moss agate - 1; and siltstone - 1. A variety of heavy cutting and scraping chores were probably performed with these tools.

Scraper/Knives (Figure 7.4f). These four tools have one edge angle in the 25 to 45° range, and a second edge with an angle in the 40 to 60° range. Edge shapes tend to be straight to convex, but 5EA799.46 has one concave scraping edge. Stage 3 (two) and Stage 4 (two) tools are present. The only complete specimen (.688) is 29.8 mm in length, 25.5 mm in width, and 13 mm in thickness.



UNHAFTED BIFACES

FIGURE 7.4

Based on the thickness measurements of the incomplete specimens, this sole complete tool appears to be somewhat larger than the norm for this category.

Knife/Chopper (Figure 7.4g). This artifact is a Stage 2 biface of Miocene chert which displays a convex, slightly sinuous edge with 1 30° angle. Wear includes edge rounding and step fractures. The specimen is broken approximately in half, yet is still 65 mm long. It is 48.4 mm in width and is 11.7 mm thick. It was apparently used for medium to heavy duty cutting or light chopping.

Knives (Figure 7.5a-e). The 41 bifaces in this category are a diverse group of Stage 3 (8) and Stage 4 (34) bifaces with edge angles between 30 and 45°, and some visible edge wear including all of the types visible under 10x magnification. This use is generally lighter than on the specimens labeled as scrapers. A variety of light to medium duty cutting chores are probably represented by this wear. Edge shapes are quite variable including irregular, straight, and convex, but no concave forms. Half (n=21) of the specimens have serrated blade edges and appear to be fragments of finished hafted bifaces. While no evidence of haft elements is preserved, these blade fragments are similar to hafted specimens described above. All serrated specimens are Stage 4 tools.

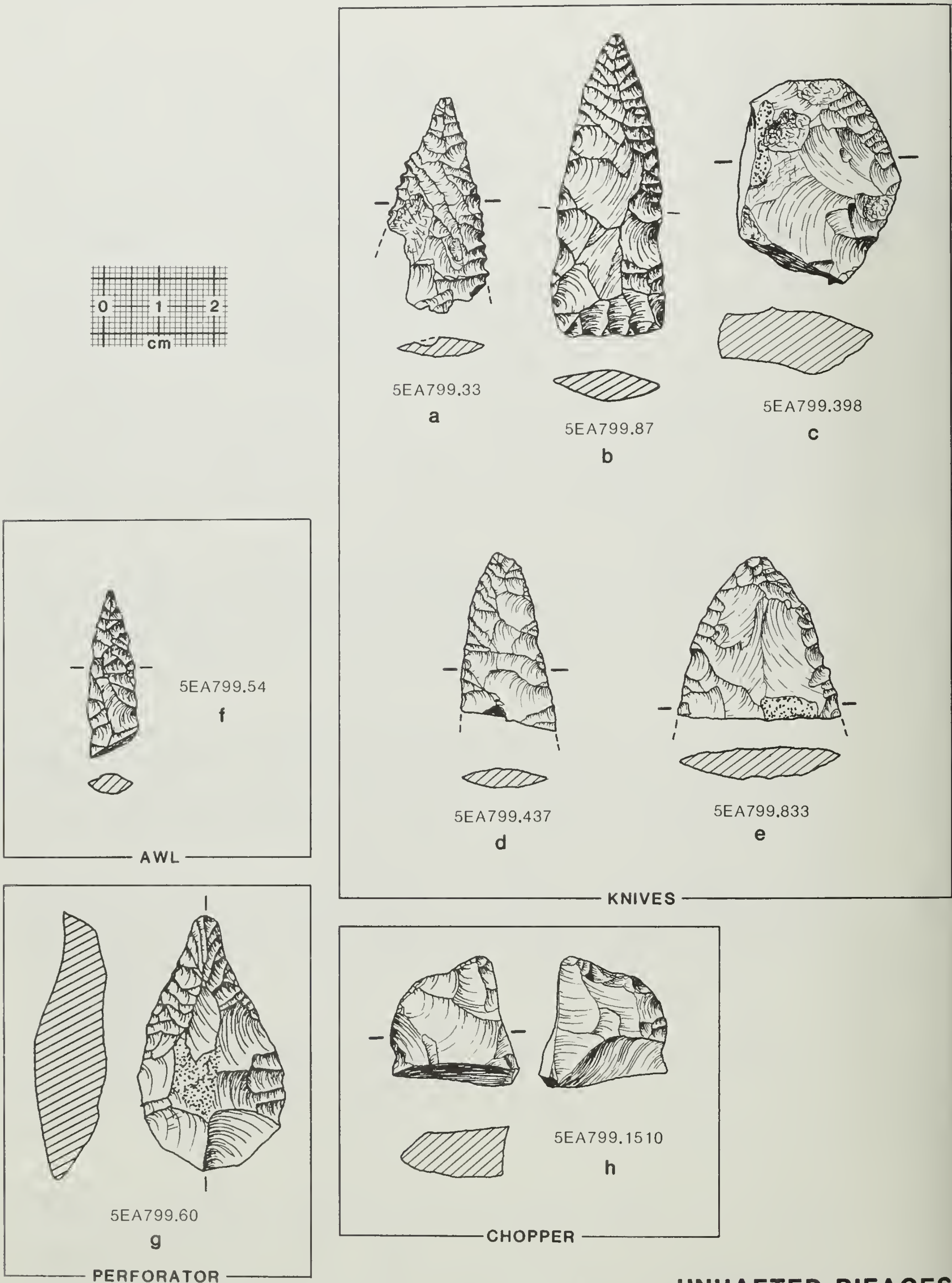
The entire class is highly fragmented including only one complete tool, a Stage 3 knife. The average thickness of the class, 5.5 mm, shows that well-thinned finished tools are represented. The tools in this category represent the end use of pieces of stone which probably had several functions during a use life that included various tasks at different stages of bifacial reduction and resharpening.

Awls (Figure 7.5f). These three tools are thinned and shaped to a very sharp tip. They are further thinned than drills and are pointed rather than spurred like gravers. All are Stage 4 or finished tools. All are of Miocene chert. Two are from definite house proveniences; the third overlies the house in lower Unit 4 soils and probably also derives from the house occupations.

Perforator (Figure 7.5g). This tool (5EA799.60) is a thick Stage 3 tool which has been retouched to have a sturdy beak at one end. The beak displays edge rounding suggestive of perforating soft material rather than step fractures or crushing that might occur in heavy etching or graving. The tool displays some cortex and has an overall teardrop shape. It is made of translucent Miocene chert.

Chopper (Figure 7.5h). The only chopper from the assemblage comes from House 1 fill. This incomplete artifact is a Stage II biface of Miocene chert. The intact margin is convex with a 55° edge angle. Battering and edge crushing were observed on this edge. Based especially on the battered edge wear and on the artifact's generally small size, light duty chopping is the inferred function.

Fragments. Five fragments are too incomplete to absolutely be assigned to a class, but all are from finished tools, most likely projectile points or knives. Two are tips, one a mid-section fragment, and two are edge fragments, one of which preserves a utilized tang (.18). Three specimens preserve serration, a common attribute of our Type 6 projectile points, and on knives.



UNHAFTED BIFACES

FIGURE 7.5

Flake Tools

The 200 flake tools from Yarmony form a highly diverse assemblage in terms of edge characteristics and tool function. Cutting, scraping, perforating, and multi-functional tools are represented, and it is possible to describe at least twenty tool classes. In spite of this diversity, however, there are several aspects of the assemblage which are uniform. With only a few exceptions, tools tend to be small, much of the assemblage is fragmentary, and reuse or multiple uses of the same tool is common. Further, over 99% of the assemblage is from local material types.

Analysis Procedure. Each flake tool was analyzed using a form with 31 entry columns. Data was entered into a data base manager. Five columns record catalogue and provenience information. An additional five record size, including length, width, thickness, weight and completeness. Material categories include type, color and presence/absence of cortex. Edge characteristics were coded for up to four edges and include a measurement of edge angle, edge shape, edge wear, and a column to designate the most prominent or heavily used edge. Edge angle was measured with a goniometer to the nearest 5°. Several measurements were taken on each edge to best approximate a single average edge angle. Edge wear was limited to several simple types visible under 10X magnification - attrition, step fractures, polish, rounding and crushing.

Modification is a column that indicates the degree of retouch or shaping present on a tool. "Utilized" indicates that no retouch occurred and use wear is present to indicate the flake is a tool. "Minimally retouched" tools are flaked only on small segments of edges, usually to smooth irregularities or to accent some natural feature of the edge. "Edged" indicates more continuous retouch on flake margins to smooth or shape the edge for use. "Shaped" indicates that the shape of the flake was modified to form the tool, and often indicates thinning as well as retouch of edges.

Other columns include a yes-no response for reuse, a yes-no entry for thermal alteration, a column for comments, and one for tool "class". Thermal alteration includes color and luster changes, potlidding, crazing and angular fractures. For the most part, this is the result of post-use burning rather than heat treatment of raw material. Comments is a space where any observation that does not fit the other columns can be entered in abbreviated form. Class is a judgmental category assigned on the basis of other attributes.

Selected attributes of flake tools are presented in Table 7.9 (at the end of the chapter) under class headings. These class headings were used for ease of data presentation and because the terms are familiar and generally understood. The categories were derived based on a long list of attributes including edge shape, edge angle, edge wear, number and arrangement of edges, amount of retouch or shaping of the artifact, and reuse. Two factors complicate using a class-based system of describing these artifacts. One is the fragmentary nature of a number of the tools - only 53 (27%) are complete. It is possible on most of these fragments to assess tool function, but such things as secondary edges and overall size and shape of the tool is often obscured. Second is the high incidence of multi-use or reuse mentioned above. Finally, most of the tools have been extensively used. Edge angles and the amount of wear on edges suggest exhausted or nearly exhausted tools, and the small size and fragmentary nature

of the tools confirms this trend. Many of the tools probably have a use history that includes a variety of functions.

Key attributes of the assemblage are the diversity of edges in the assemblage and the intensity of use of the tools. These factors have served to obscure the distinctions between some classes. Thus, some of the attributes of the entire flake tool assemblage are of more interest than the distinctions between the "classes". Discussion of the flake tools will focus on edge characteristics.

Material. As would be expected, local chalcedonies and cherts are dominant among the material types, and other local materials such as siltstones, agates and igneous rocks compose almost all of the remaining tools. Only a few tools, including two microscrapers, are made from materials that may be non-local in origin. Thermally-altered tools comprise 37% of the collected flake tools, compared to more than double that figure among the bifaces. Since the heat treatment appears to have been excessive and incidental rather than intentional, this difference in percentages may be attributable to discard patterns, with bifaces ending up in proveniences that experienced post-use burning. For instance, if bifacial implements were more often used for indoor tasks and the unifacial tools more for exterior activities - and a structure such as Pit House 1 then burned upon abandonment - the post-occupational burning would selectively alter more bifacial tools than flake tools. This explanation is but one of several possibilities, however, and should not be viewed as the most probable cause without further investigation of this pattern.

Tool Shaping. Four degrees of flake modification were recognized during analysis, as mentioned above. Each category denotes slight differences in degree of retouch. Very few tools (18) were extensively shaped; the majority (121) display edge retouch sufficient to form a working edge, but which does not alter the basic shape of the flake. Although the difference is slight, a distinction was made between simple utilized flakes (30) defined on use wear, and flakes showing minimal retouch on edge segments (31).

In terms of the dichotomy between "expedient" versus "formal" or patterned tools, only the shaped tools could be considered to be formal, and even these are simple to manufacture. The emphasis within flake tools was on making useful edges or facets for use, rather than on tool outline or form.

Table 7.1 shows the relationship between the broad functional groups and the degree of shaping. Of note is that cutting flakes are limited to the "expedient" categories. Formal knives are bifacial. Most of the tools with perforating functions require more manufacture and are thus edged or shaped. More specific discussion of functional groups is presented below.

Perforators. Tools in this category can include drills, awls, borers and gravers. Some 29 tools are in this group, and of these 24 have secondary

Table 7.1

Degree of Retouch for Functional Groups
Among Flake Tools

Functional Group	Utilized	Minimum Retouch	Edged	Shaped	Total
perforator	1		4	1	6
perforator/ multipurpose	1		17	5	23
multipurpose	2	8	29		39
cutting	14	8	15		37
scraping	9	15	50	11	85
resharpening			3		3
wedge				1	1
TOTAL	30	31	121	18	200

utilized edges. This includes six perforators and 23 multipurpose tools with perforating edges. Figure 7.6 illustrates the range of bits on perforating tools.

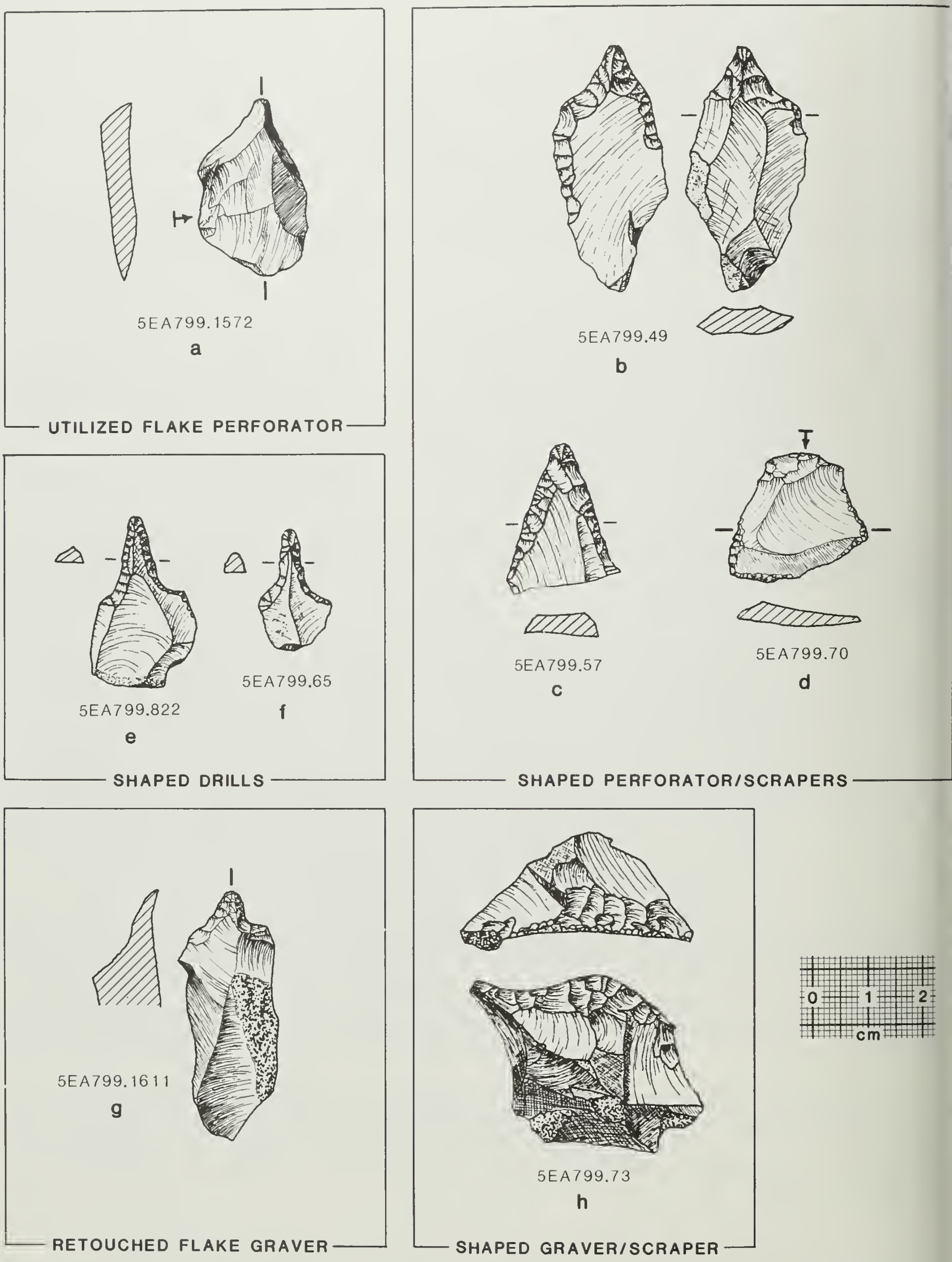
Secondary edges on these tools are commonly scraping edges (22 of 31 cases, Figure 7.6b-d,h) while cutting edges are less common (9 of 31 cases). Eighteen perforating tools are from the House Locus, five from the Late Archaic soil unit 4 and six from Soil Unit 5.

Cutting/Scraping Tools. Multipurpose tools are quite common in the Yarmony flaked tool assemblage. In addition to the 23 perforator composites mentioned above, there are 39 other composites with cutting/scraping edge combinations. A selection of these is illustrated in Figure 7.7. None of these tools are shaped. Twenty-nine of the 39 tools are from the House Locus, two from the F-14 Locus, three from Soil Unit 4 and four from Soil Unit 5.

Flake Cutting Tools. These 37 tools have low edge angles, less than 45°, and none are shaped tools. In fact, over half (56%) display either utilization only or minimal retouch. Only two have a single utilized edge; most have at least two, 11 have three, and four display four edges. Edge forms are variable, as can be seen in Figure 7.8. The House Locus accounts for 22 specimens, F-14 for two, Soil Unit 4 for seven, and Soil Unit 5 for six.

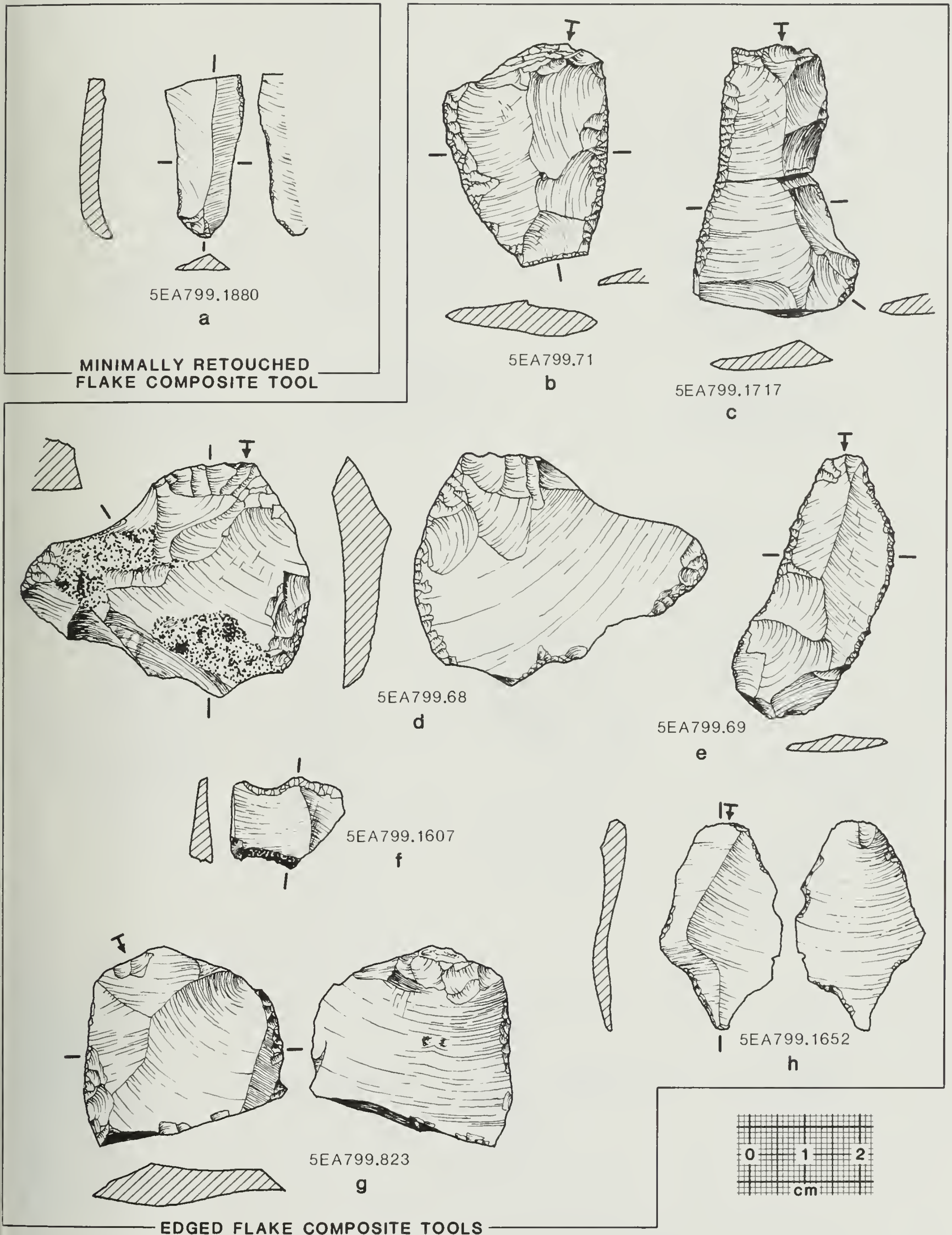
Scraping Tools. These tools are classified into three groups: shaped scrapers, shaped spokeshaves, and scraping flakes. The nine shaped scrapers are variations on end and distal-lateral scrapers (Figure 7.9a-g). Both spokeshaves are well retouched notches (Figure 7.9h,i). Both tools overlie the House Locus in later age soils.

Unshaped scraping flakes are the most numerous single category in the assemblage with 74 specimens. These tools have edge angles of 45° or greater, and, unlike other categories, most have only a single working edge (17 have two; one has three; and one has four). A variety of scraping tasks are indicated,



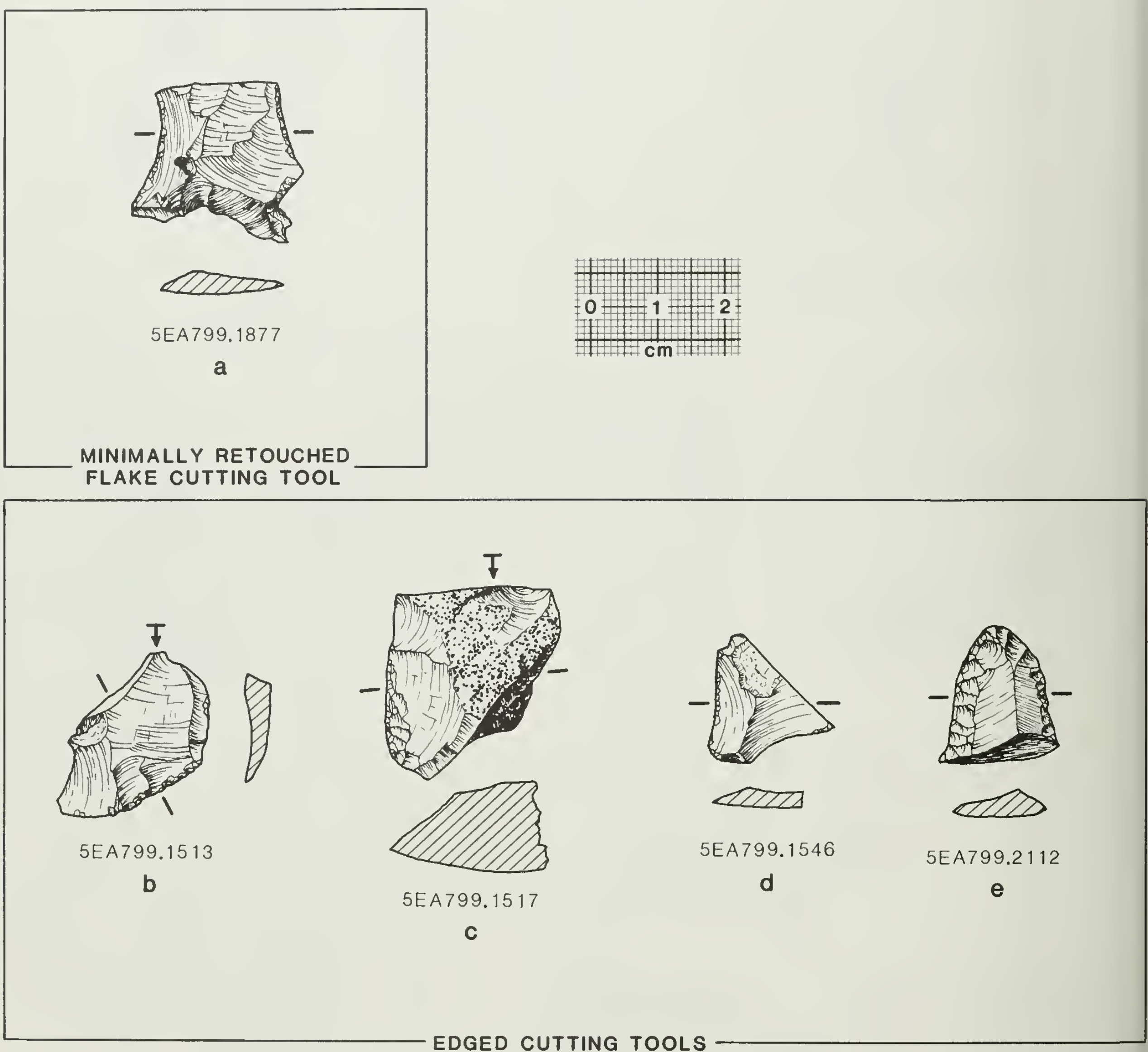
FLAKE TOOLS (perforating)

FIGURE 7.6



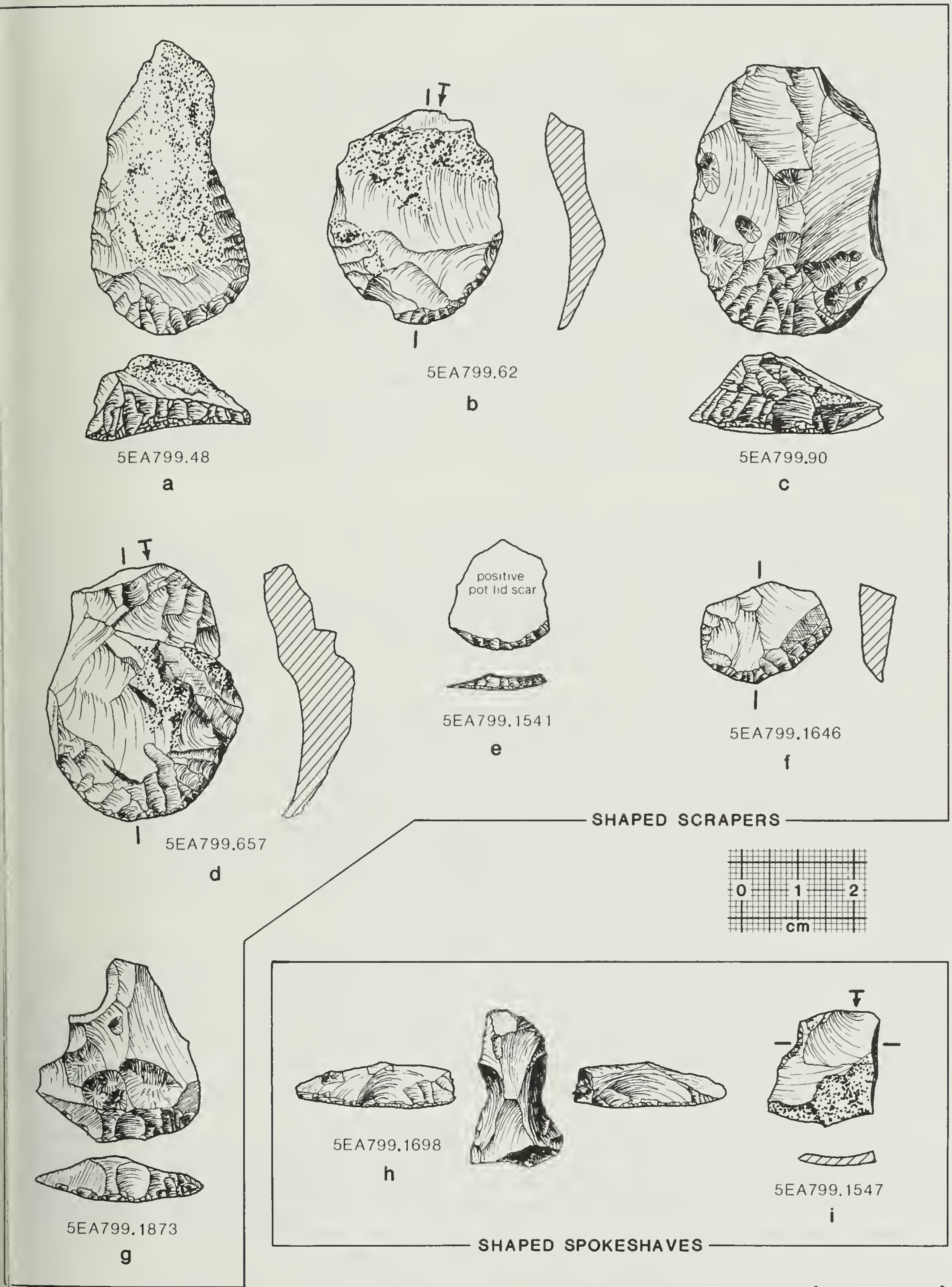
FLAKE TOOLS (cutting/scraping)

FIGURE 7.7



FLAKE TOOLS (cutting)

FIGURE 7.8



FLAKE TOOLS (scraping)

FIGURE 7.9

and it is likely that some worn-down cutting edges have ended up in this category. Edge form is quite variable (Figures 7.10, 7.11a-e). Provenience is: House Locus - 46; F-14 - 4; Soil Unit 4 - 13; Soil Unit 5 - 11.

Microflake Tools. Most tools in the Yarmony assemblage are small, but six are really tiny, yet appear to be complete or nearly complete tools. Light duty cutting and scraping are indicated. Three of these tools are from the House Locus, one from Soil Unit 4 and two from Soil Unit 5.

Resharpening Flake Tools. Three tools are made on bifacial resharpening flakes, rather than on flakes produced for use. Primarily cutting use is evidenced. Two are from the House Locus, one from Soil Unit 4.

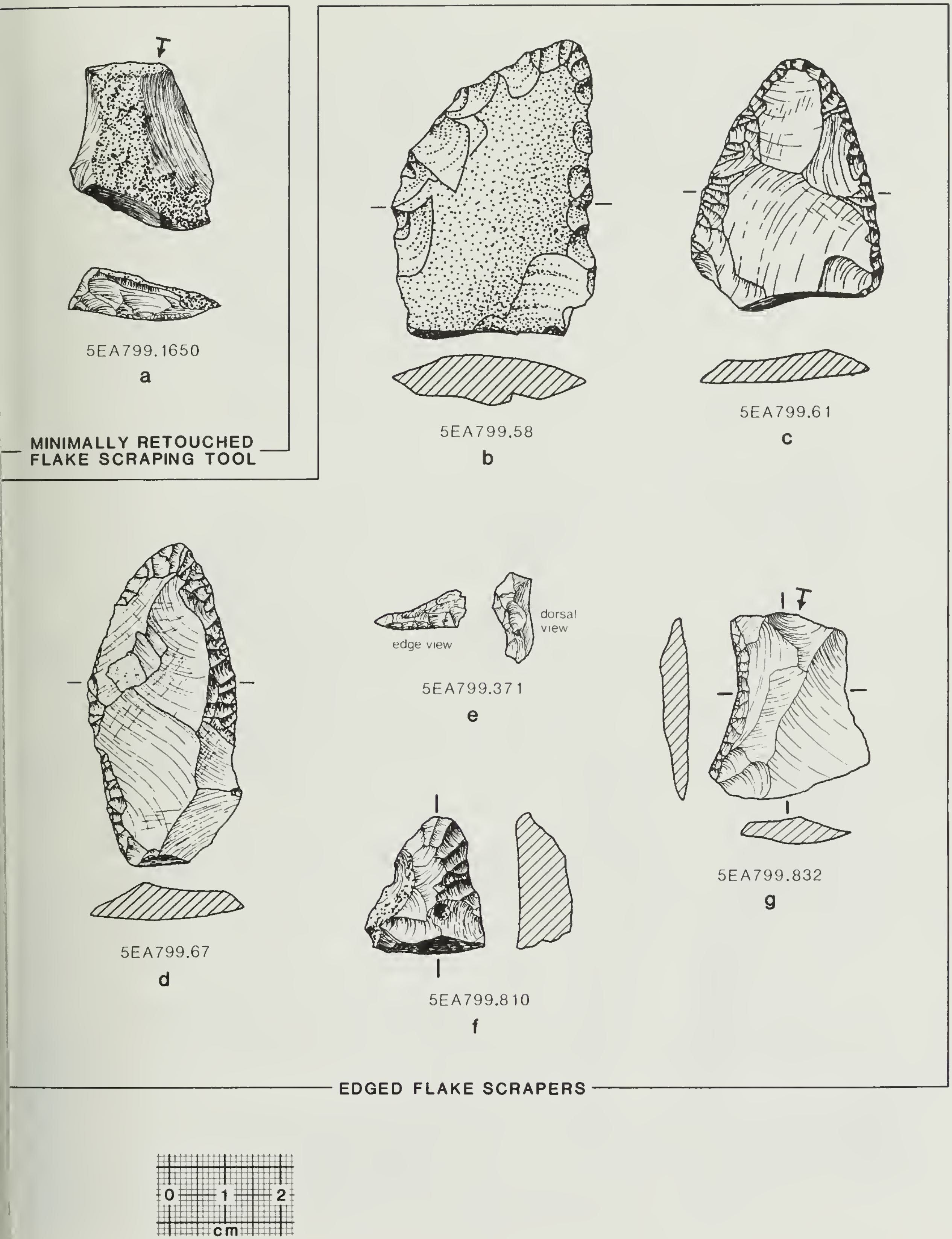
Flake Wedge. Wedge-shaped tools of three types were found associated with the house. The flake wedge is a piece of basalt formed by burin-like blows to shape flake margins (Figure 7.11f). It was associated with House 1, and excavators recall having discarded one or two less obvious specimens during excavation.

Edge Characteristics. Because there are few "formal" or patterned tool forms within the flake tool assemblage, it makes sense to emphasize edge characteristics in a discussion of these tools. Important edge attributes include edge angle, shape, wear patterns, and arrangement of edges. Variables such as length of retouched/utilized edge or ratios of utilized edge to weight could also be used, but the Yarmony collection is too fragmentary for these numbers to be meaningful.

The 200 tools have some 335 retouched or utilized edges, an average of 1.68 per tool. Just over half, 103, have a single working edge. Multiple edges occur on 97 tools - 65 have two, 25 have three, and six have four working edges. These edges vary in angle from 15° to 90° and come in a wide range of shapes including beaks or spurs, spokeshave notches, and forms like concave, straight, recurvate, convex and irregular. Serrated or denticulate edge modifications occur on 14 tools. Retouch tends to be fairly fine, and on most tools is restricted to segments of edges. The variety in edges can best be seen in illustrated form (Figure 7.6-7.11).

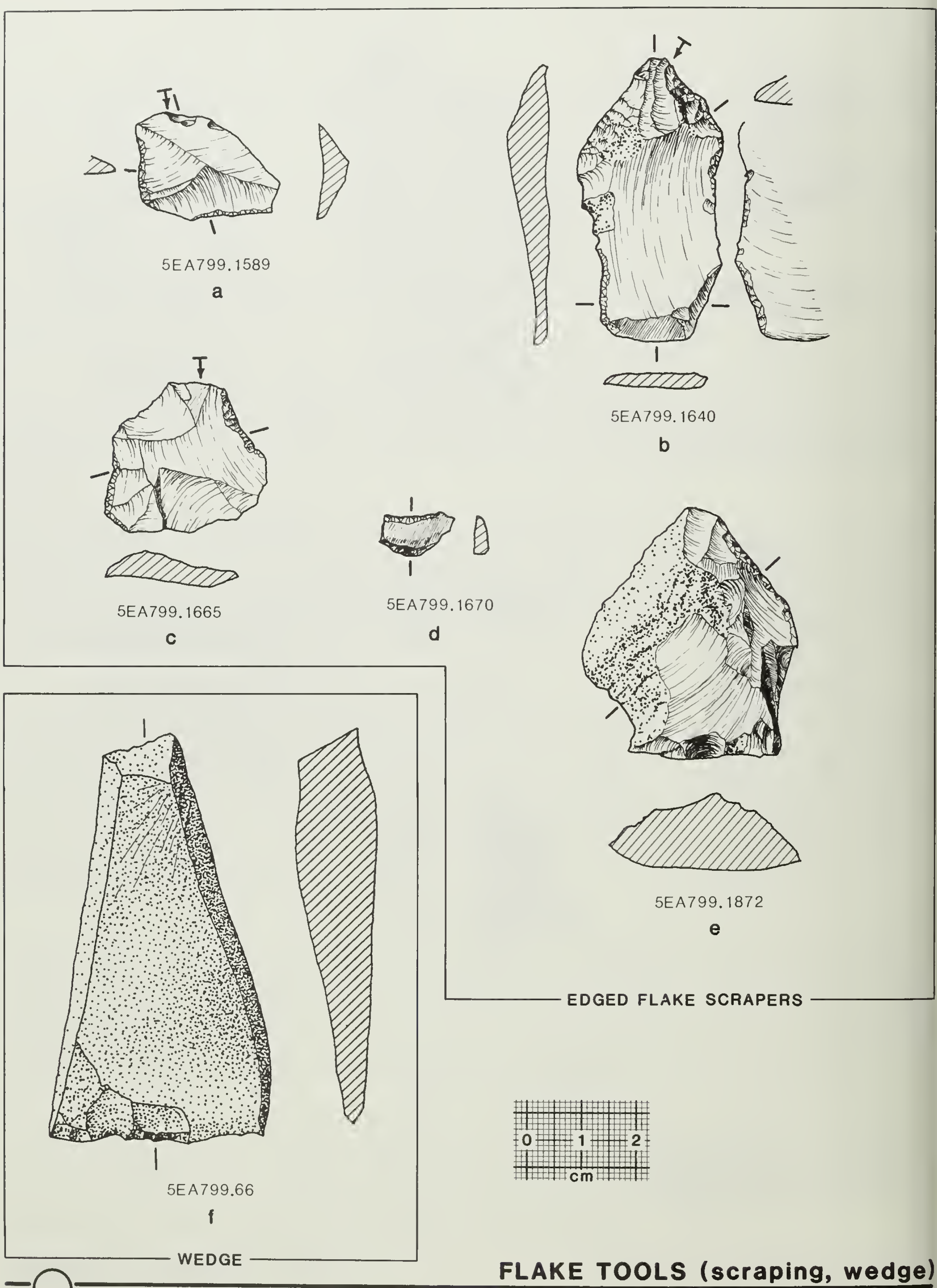
Edge angle was looked at in combination with edge shape, primary edge location, and edge wear to assess the range of functions present and to see if any flake or edge forms were preferred for certain tasks. Edge angles range from 15° to 90° and average to about 48°. Edge shape has no significant patterns with regard to edge angle except with regard to specialized tools classes such as spokeshaves. Number of working edges has no significant variation either. Average angles for edges 1-4 on all tools varies only between 48° and 50°.

Primary edge location was used to designate the most prominent or heavily used edge on tools. These include distal (22), distal-lateral (33), lateral (105), projections (27), proximal (6), proximal-lateral (5), proximal-distal (1) and unknown (1). Tools with proximal utilization have steep edge angles, as would be expected when the striking platform is modified for further use. Other edge locations average in the 47° to 49° range.



FLAKE TOOLS (scraping)

FIGURE 7.10



FLAKE TOOLS (scraping, wedge)

FIGURE 7.11

Figure 7.12 plots edge angles for all used edges and shows the relationship between edge wear and edge angle for Edge 1. For Edge angle 1, there is a very weak bimodality with a slight peak in edge angle at 30°, and a broad representation of edges in the 45° to 60° range. Edge 2 shows a peak at 40° and Edge 3 shows some tendency to cluster above 50°. The aggregate assemblage simply shows high frequencies of tools with edge angles between 40° and 60°.

Edge wear (attrition, rounding, polish, step fracture) is visible on some 322 of the 334 edges, a clear indication of the use intensity of the tools. Attrition is the most common form of wear, present on 147 edges between 15° and 75° angle. There is a slight tendency for these edges to occur more frequently at lower edge angles, but the tendency is weak. Edge rounding occurs on 62 edges within the 20° to 70° range with slight peaks at 30° and 40°, and a pronounced peak in the 50° to 60° range. Polish, a similar type of wear, occurred on only three specimens with cutting or scraping functions implying use on soft to only slightly resistant materials.

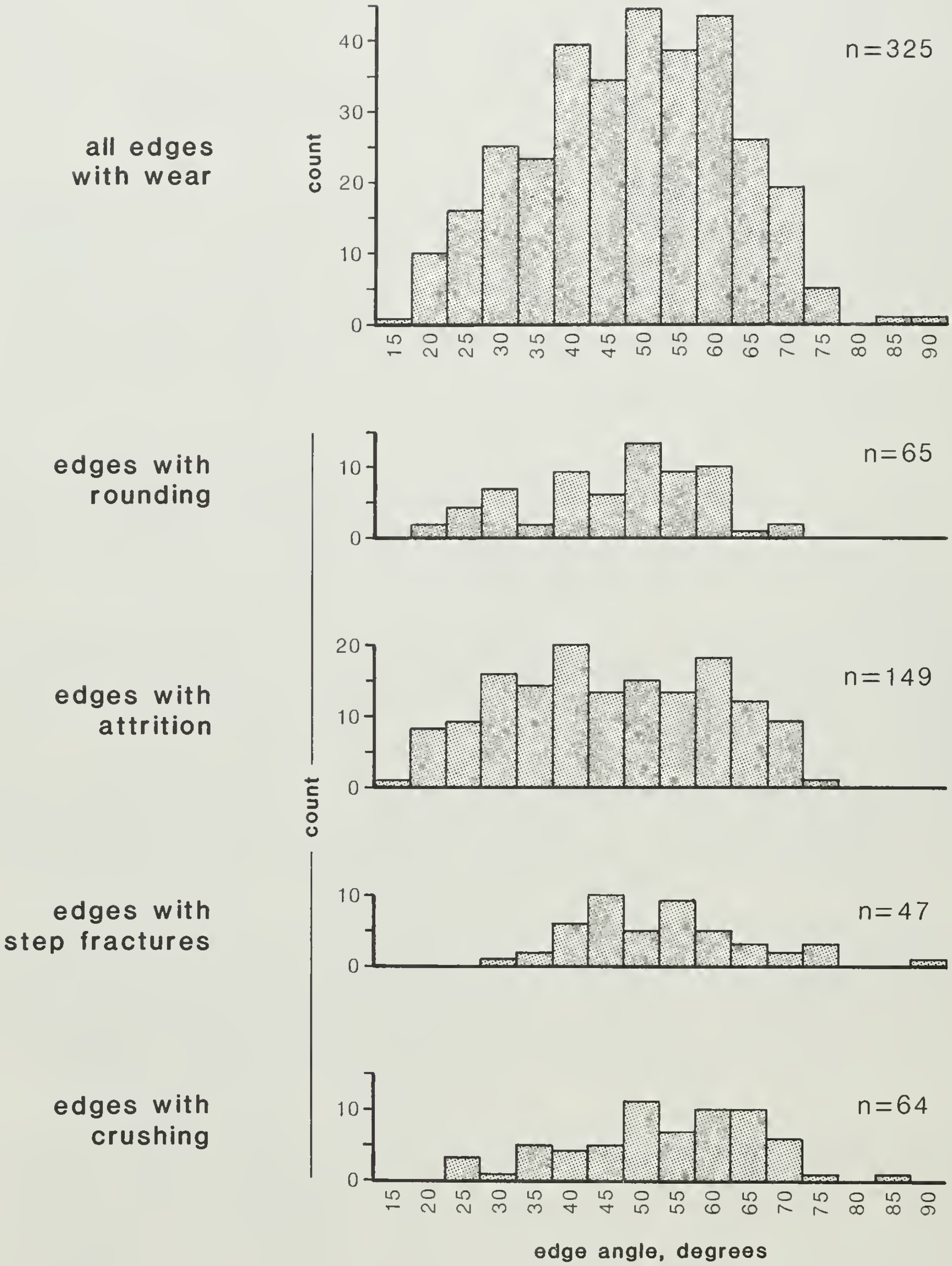
Step fractures occur on 47 edges between 35° and 90° with bimodal peaks at 45° and 55°. Relatively heavy cutting and scraping tasks could occur in this range of edge angles. Edge crushing, the roughest form of wear on the flake tools, occurs on 63 edges between 20°and 85°. Most edges with crushing are between 50° and 70°, a predominantly scraping range of angles.

<u>Distribution of Flake Tools</u>. The proveniences of the flake tools, broken down by broad functional group, is presented in Table 7.2. The House Locus accounts for 128, or 65% of the assemblage, the East Road Cut for two scrapers, and F-14 for eight items. All of these loci are Early Archaic in age.

Soil Units 4 and 5 account for 31 artifacts each, and are Late Archaic and Late Prehistoric in age. As was the case for bifaces, most of the artifacts in these soil units directly overlie the houses, and several lines of evidence suggest that many of them derive from bioturbation of the house deposits.

Only seven artifacts in Late Archaic Soil Unit 4 do not overlie the houses, and, of these seven, three are in units directly adjacent to House 1. Thus, only four flake tools are clearly not related to House 1 or House 2. Three of these are from a test unit directly southwest of House 2 (127N 92E), a unit which is quite rich, but for which the stratigraphy is not entirely clear. The fourth artifact is from at isolated test unit, also without clear stratigraphy.

Artifacts in Soil Unit 5 have a similar chance of deriving from the house occupations, except that there clearly is a Late Prehistoric component which overrides the house. Twenty-six of the 31 Soil Unit 5 flake tools come from the block excavated above the houses, but, of these, 11 are from perimeter units where most or all of the fill is outside the house perimeter. An additional five tools come from units in the Ceramic Locus north of the house. Both the ceramics in Soil Unit 5 and the lower Unit 5 date from above House 1 argue for a Late Prehistoric component. Mixing is still a problem, but the Late Prehistoric component is present, whereas evidence of a Late Archaic component is thus far tenuous.



EDGE ANGLE - EDGE WEAR COMPARISONS

FIGURE 7.12

Table 7.2

Tool Class by Component
Among Flake Tools

Class	East Road Cut	House Locus	Feature 14 Locus	Soil 4 Late Archaic?	Soil 5 Late Preh.	Total
perforators		18		5	6	29
c/s composites		29	2	3	5	39
flake/cutting		22	2	7	6	37
flake/scraping		46	4	13	11	74
scrapers	2	7				9
spokeshaves				1	1	2
microflakes		3		1	2	6
resharpening		2		1		3
wedge		1				1
TOTAL	2	128	8	31*	31	200

* All but 12 of these tools directly overlie houses; 7 of the 12 are from units directly adjacent to House 1.

Cores and Core Tools

Eight chipped stone implements are classified as cores. Basic information on these appears in Table 7.3. Three of the specimens which show no sign of utilization were recovered from House 1 fill. Specimen .641 is a lag pebble of low grade chert which was tested, but not further reduced. Specimen .742 is a small exhausted core of moss agate, while .882, also a small exhausted core, is of dark gray igneous rock. Also from above House 1, but in Soil Unit 4, is

Table 7.3

Cores and Core Tools

Catalog #	Component	Material	Weight (gm)	Inferred Function
.341	House Locus	dk gray siltstone	27	wedge/knife
.641	House Locus	Miocene chert	33	tested pebble
.658	House Locus	Miocene chert	10	exhausted core/perforator
.742	House Locus	moss agate	18	exhausted core
.882	House Locus	dk gray igneous	50	exhausted core
.883	House Locus	dk gray siltstone	150	chopper/knife
.884	House Locus	banded igneous	256	chopper/hammerstone
.2060	Late Preh.?	Miocene chert	33	pebble core

Specimen .341 (Figure 7.13a). This tool shows minimal bifacial retouch on a angular piece of dark gray siltstone, and appears to be another wedge. Alternatively, the tool would function for heavy cutting.

Specimen .658 is a small exhausted core of Miocene chert with a utilized beak (Figure 7.13b). It is from the fill of House 1.

An interesting tool from House 1 fill is .883, an angular piece of dark gray siltstone or shale with a sturdy edge displaying irregular bifacial retouch and utilization (Figure 7.13c). Heavy cutting or light chopping or splitting are possible functions.

Specimen .884 was recovered from the House 1 floor. It is a battered and retouched cobble of dark gray/red-brown banded igneous rock with a sinuous bifacial edge (Figure 7.14). Chopping and hammering are indicated by edge battering.

Finally, Specimen .2060 was recovered from Soil Unit 5 on the south edge of House 2. It is a bifacially retouched flake pebble of a mottled piece of Miocene chert lag. It has edges suitable for cutting tasks, but displays no obvious use wear.

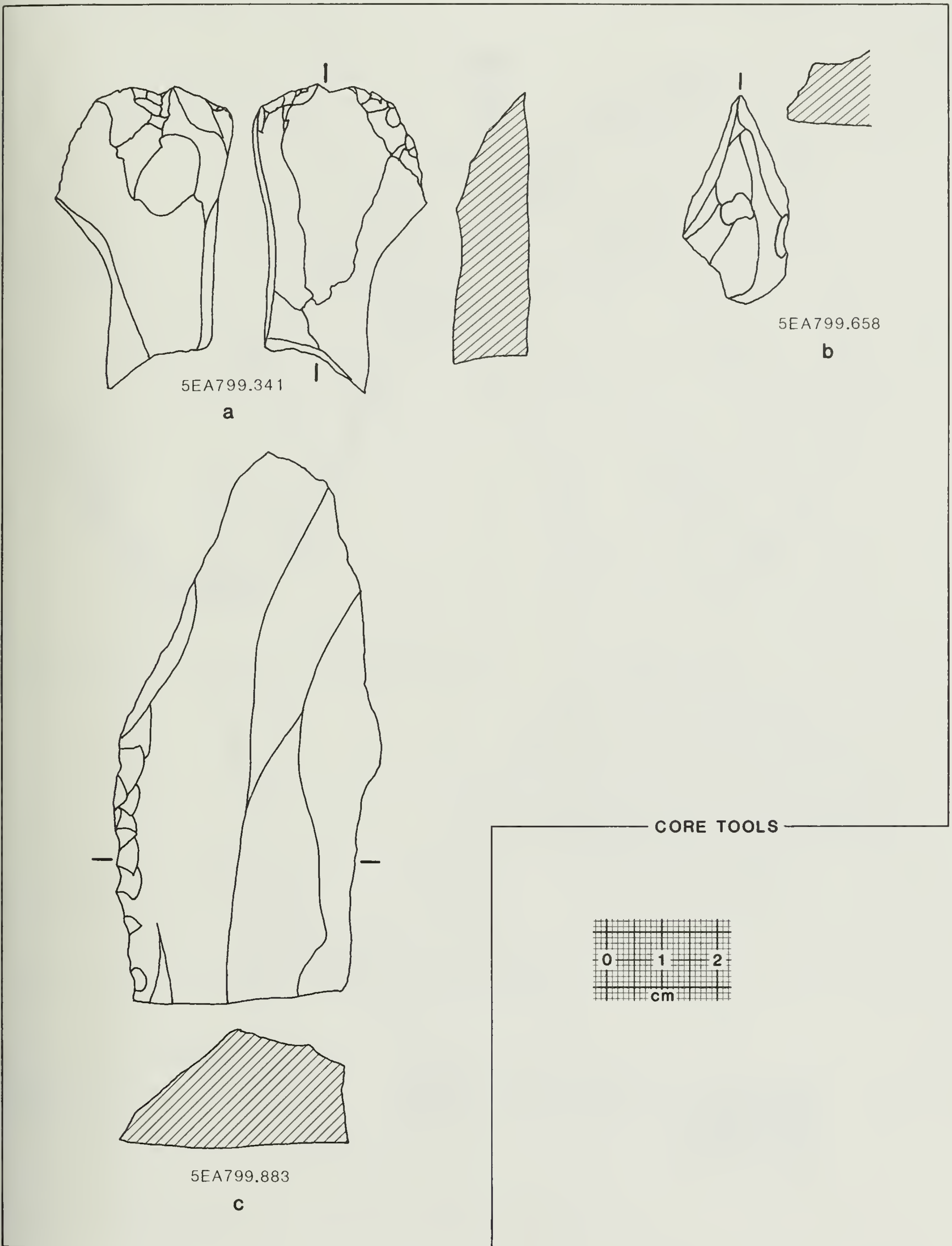
The core/core tool assemblage is very small compared to the volume of chipped stone, and, except for the two heavy duty tools, specimens are small and/or exhausted. Conservation and thorough use of available raw materials is suggested.

Lithic Debitage

Analysis of debitage from the Yarmony site included an intensive attribute analysis of each piece. Categories analyzed were context within site, raw material, technology, and miscellaneous observations such as thermal treatment. Specific attributes within these categories include provenience, material, flake type, presence-absence of cortex, presence-absence of thermal alteration, and miscellaneous comments. Analysis was directed at simple density plotting of flakes distributions as well as at comparisons of material type and flake type between spatial and temporal units.

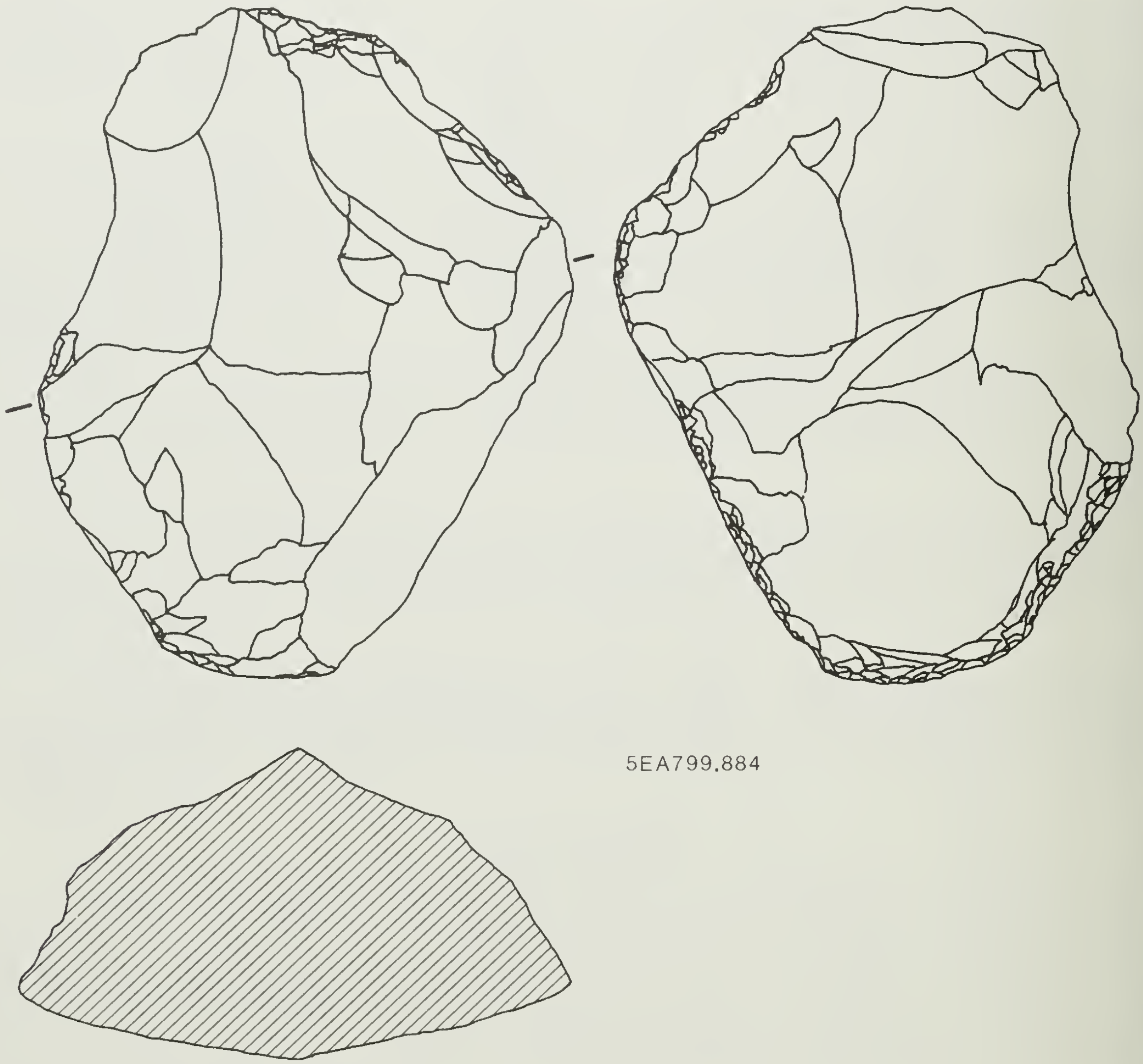
MAC uses a flakes classification system similar to that proposed by Sullivan and Rozen (1985), but uses definitions largely derived from Ahler (1986:70). Flakes are sorted according to attributes as shown in Figure 7.15. Debris are pieces on which no "single interior surface" can be defined (Sullivan and Rozen 1985:758). Flake fragments are pieces where a single interior surface can be defined, but which lack platforms or other diagnostic features.

Bifacial thinning flakes are defined on the following attributes: "A thin flattened transverse cross-section; a thin, curved longitudinal cross-section; very acute lateral and distal edge angles associated with feathered terminations; presence of multiple dorsal flake scars originating from varied directions, including opposite that of the subject flake; a narrow faceted and prepared platform representing a small segment of a prepared and dulled bifacial tool edge; a lipped platform; little or no cortex on the dorsal flake face; an expanding flake shape; and a diminutive, flattened or subdued positive bulb

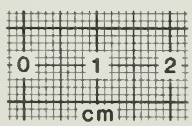


CORE TOOLS

FIGURE 7.13

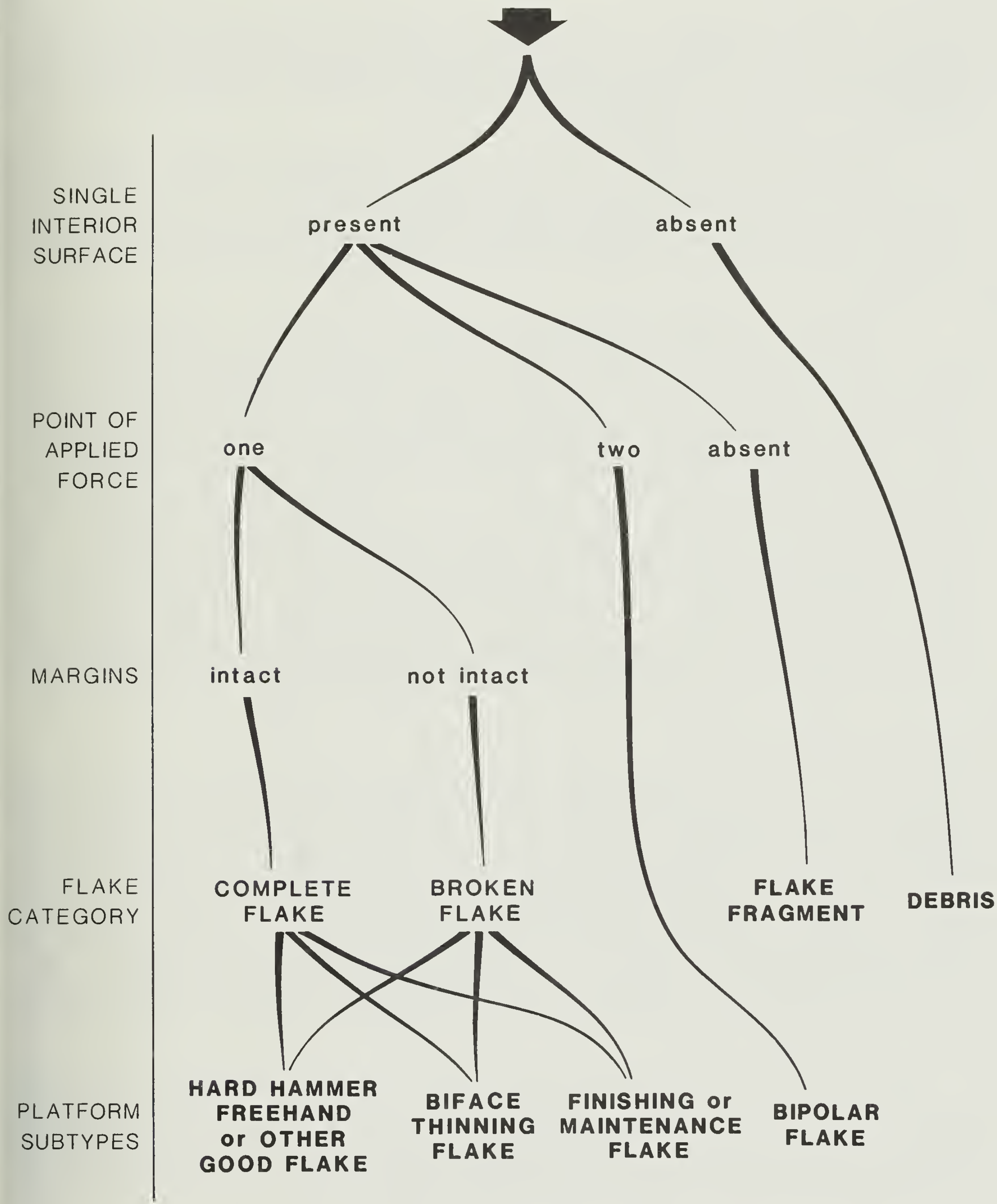


CORE TOOL



CORE TOOL

FIGURE 7.14



DEBITAGE SORTING KEY

FIGURE 7.15

of force." (Ahler 1986:70). Hard hammer freehand or other good flakes (HHOGF) contains flakes that display classic hard hammer platform characteristics (e.g. Crabtree 1972) as well as other flakes with platforms that are not clearly diagnostic of bifacial reduction.

In order to distinguish between bifacial reduction and the final stages of tool manufacture or tool resharpening, a category called finishing/maintenance has been added to Ahler's types. These flakes are less than 1.5 cm in length, preserve a platform and except for size, are similar to bifacial thinning flakes. Soft hammer and pressure flaking techniques are probably reflected in the category.

Classifying flakes in this manner allows comparisons to be made between site loci based on relative percentages of the various flake types. Since each flake type indirectly reflects technology and approximate stage of tool manufacture, the make-up of a debitage assemblage is a good indication of the range of stone tool-oriented activities that occurred in a locus. For example, early-stage lithic reduction - preparing and reducing cores leaves high lithic densities and high relative proportions of debris and of HHOGF flakes. Intermediate stage bifacial thinning of cores and blanks leaves high lithic densities as well as high proportions of bifacial thinning flakes. Tool finishing and maintenance results in lower lithic densities, smaller flakes, and higher proportions of F/M and bifacial thinning flakes. While there are no clear lines of demarcation to indicate what proportions of flake types should indicate what activities, differences in the make-up of flake assemblages indicate differences in lithic activity. In combination with other aspects of the assemblage, this helps to interpret the range of prehistoric activities.

Flake Type Distribution

Table 7.4 presents the flake-type breakdown for the site with each type expressed as a relative percentage of the component's assemblage. Although some 4077 flakes were analyzed from the site, only 4,053 are from known proveniences. The other 24 are from disturbed contexts. Given the volume of earth excavated, this is an overall moderate lithic density. The highest flake density in the site is found in unit 127N 92E just west of House 2 with 50 flakes in the 35-40 cmbs level. Elsewhere, high flake densities are less than 20 per 5 cm level and the average density is less than 10 per level. As can be seen in Table 7.4 most of the flakes were recovered from the Early Archaic levels associated primarily from the House Locus. Other loci include the East Road Cut, F-14, and the eastern test pits.

The East Road Cut appears to be a small animal processing activity area, and the low flake density of 16 total flakes supports a non-lithic reduction function for the locus. Relatively high proportions of finishing/maintenance flakes, bifacial thinning flakes, and fragments indicates casual flaking of finished or near-finished tools such as would result from use and re-sharpening.

Debitage data from the House Locus is presented under three headings in Table 7.4, House 1, House 2, and "other Early Archaic". Flakes from floor and lower fill proveniences are tabulated under the appropriate house heading. All other flakes from the locus are in the "other" column. Relative proportions of flake types within the House Locus are similar between the various proveniences

Table 7.4
Flake Type Percentages by Component

Flake Type	East Road Cut	House 1	House 2	Other Early Archaic	Late Archaic	Late Preh.	Feature 14	ETP	All
broken bifacial	25.0%	15.0%	7.2%	24.9%	22.4%	23.3%	3.3%	2.0%	19.2%
complete bifacial	0	6.2	6.5	8.3	5.8	5.6	5.9	10.2	6.6
broken HHOGF	6.3	6.4	4.1	10.1	9.7	9.5	2.2	6.1	8.1
complete HHOGF	6.3	2.5	6.1	4.1	4.0	4.2	11.2	24.5	4.6
debris	0	1.3	9.2	3.4	4.3	4.4	13.2	14.3	4.6
flake fragment	31.3	27.4	24.5	24.0	27.0	27.7	27.5	28.6	26.1
finishing/maint.	31.3	41.2	42.0	25.8	26.8	25.3	36.4	14.3	30.8
TOTAL FLAKES (n)	19	770	293	1187	805	661	269	49	4053

Note: Column percentages may not add to 100 due to rounding.

but some minor differences exist. Most apparent is the higher relative percentage of finishing/maintenance flakes within house contexts, over 40% in each house. Conversely, both bifacial and HHOGF flakes are relatively more plentiful in general Early Archaic proveniences outside the houses. It is tempting to explain this dichotomy as a functional difference between indoor and outdoor space with tool use and maintenance occurring indoors and tool reduction more prevalent outdoors. Two caveats must accompany such an inference, however. First, of course, is the high degree of mixing mentioned elsewhere. Small items such as FM flakes might have a different rate of mixing during bioturbation, and observed patterns may be conditioned by non-cultural factors.

Second, floor and interior feature fill in House 1 was almost entirely water screened. Thus, we are comparing flakes recovered by methods of different recovery intensity. The sample of flakes has not been adjusted to reflect the higher recovery rate of very small flakes from water screened units. In spite of definite bias in recovery method, the dichotomy is probably valid, but it is not possible to measure this accurately. Few microflakes were noted during excavation, but some undoubtedly were missed in units screened with 1/4" mesh. House 2, largely unexcavated, can serve to test this inference simply by use of a more rigorous control sample of waterscreen from all levels of the excavation.

The debitage profiles from Soil Units 4 and 5 have very similar relative flake types, and these are also almost identical to the "other Early Archaic" column. This may, in part, be due to mixing in the House Locus, but probably also reflects long term similarity in the use of outdoor space.

The Feature 14 area, along with the eastern test pits, differ from the rest of the site in having relatively lower proportions of bifacial thinning flakes and relatively high proportions of HHOGF flakes. Proportions of complete flakes are also slightly higher. This difference is also reflected in material types with Feature 14 having relatively higher amounts of igneous material than other site loci. Feature 14's debitage profile shows slightly more early stage manufacture and less conservation of tool stone than does the House Locus. A high proportion of finishing/maintenance flakes shows that activities are balanced in the locus, however, and lithic densities are too low for tool manufacture to have been a primary activity.

Material Type Distribution

As with tools, the debitage assemblage is comprised almost entirely of locally available material types. Miocene materials (Browns Park/Troublesome Formation) account for almost 60% of the materials. Other cherts and chalcedonies account for an additional 21.5% of the assemblage. Other materials include both clear and moss agates, metamorphosed siltstone, igneous materials - fine-grained basalt and rhyolite - and quartzites. Two flakes each of obsidian and quartz crystal were also recovered from the Early Archaic House Locus. Of all of these material types, only the obsidian is definitively exotic. A few flakes of chert and chalcedony are likely to be exotic as well, but a solid estimate would be that less that 5% of the flakes derive from distant sources.

Table 7.5 presents the breakdown of material types within the debitage expressed as a relative percentage of each component or analytical unit. Although all loci and levels of the site display a preference for local

Table 7.5
Debitage Material Type Percentages by Component

Material Type	East Road Cut	House 1	House 2	Other Early Archaic	Late Archaic	Late Preh.	Feature 14	ETP	All
Miocene chalcedony	56.3%	51.2%	34.1%	44.1%	29.9%	35.9%	7.8%	38.8%	38.0%
Miocene chert	6.3	18.6	37.9	19.8	21.6	19.5	22.7	18.4	21.4
other chalcedony	18.8	2.5	4.8	4.5	15.4	8.2	23.4	4.1	8.3
other chert	6.3	11.9	10.5	11.3	15.4	18.3	11.1	4.1	13.2
clear agate	0	3.2	tr	3.9	3.2	4.7	0	0	3.2
moss agate	6.3	4.8	4.4	5.3	5.3	4.4	12.6	0	5.5
siltstone	6.3	3.8	5.5	5.7	4.5	5.0	13.4	2.0	5.4
igneous	0	2.9	1.0	4.6	2.3	1.9	7.1	6.1	3.6
quartzite	0	tr	tr	tr	1.7	1.5	1.8	0	1.1
TOTAL FLAKES (n)	19	770	293	1187	805	661	269	49	4053

Note: Column percentages may not add to 100 due to rounding.
tr: trace, <0.1%

materials, there are some differences in the specific materials utilized in various site contexts. For example, Miocene cherts are the most frequently utilized materials in all areas, but are more prevalent in the House and Early Archaic units than in later levels or other loci. Material percentages in the three Early Archaic units of the House Locus are similar, probably in part because of the cultural and natural mixing processes that have characterized the site's formation. Sample size in the East Road Cut (19 flakes) is too small for meaningful comparison except to say that there are differences, especially in the non-Miocene cherts and chalcedonies.

The possible Late Archaic and the Late Prehistoric levels show slight decrease in the use of Miocene materials with an increase in the use of other cherts and chalcedonies as compared to underlying Early Archaic levels. Use of other material types is similar.

The F-14 locus displays the clearest differences in material makeup. Miocene cherts comprise only 30.5% of the collected materials, while other cherts and chalcedonies account for an additional 34.5%. Moss agates, believed to derive from river or terrace gravels, are 12.6% of the assemblage, and siltstones and igneous material display the highest percentages of any locus. Flakes of the latter two types tend to be larger HHOGF flakes. This trend toward larger items is also reflected in the tools where the larger, rougher tools tend to be made of these two materials.

Sample size is low for the Scattered Test Pits, and this category is, in any event, a catchall for scattered and possibly unrelated units.

Use patterns for the coarser material, especially igneous rocks, is of interest. Overall, the fine-grained basalts and rhyolites comprise only 3.6% of the debitage. The highest percentages of the material occur, however, in the non-house Early Archaic levels of the House Locus - mainly midden from occupation of House 2 - and in the midden-like F-14 area. Siltstones, too, tend to occur outside of the houses, although this pattern is not quite as strong as for igneous rocks.

Also notable is the paucity of quartzite in the assemblage. Some local quartzites occur - the Morrison Formation outcrops within a few km of the site - but evidently quartzites are rare, or not readily accessible nearby.

Ground Stone

Like the chipped stone assemblage, the ground stone at Yarmony is quite varied, although most are milling stones. Some 140 pieces were analyzed, 90 from the House Locus, 30 from the Feature 14 locus, and the remainder from Soil Units 4 and 5. The ground stone was analyzed using data encoding forms with columns for recording variables for provenience, material, morphology, metrics, manufacture, and wear patterns. A data base manager was utilized to store, sort, and retrieve data on each artifact in the same fashion as described for chipped stone. The tools are categorized into 11 classes for description, and are summarized in Tables 7.6 and 7.7.

Table 7.6

Distribution of Ground Stone

Tool Type	House 1	House 2	Feature 14	LA Soil 4	LP Soil 5	Unknown	TOTAL
abrader	2		1				3
mano	18	9	7	3	2		39
mano/digger	1						1
mano/maul	3	1					4
metate fragment	15	11	15	4	4		50
slab metate	7	3	4	1	5	1	21
basin metate	12	1					13
polishing/ hammerstone	1						1
comál	4		3				7
polishing stone	1						1
TOTAL	65	25	30	8	11	1	140

Table 7.7

Ground Stone Material Types

Tool Type	sandstone	quartzite	basalt	other igneous	TOTAL
abrader	2			1	3
mano	24	5	2	8	39
mano/digger		1			1
mano/maul	1	2		1	4
metate fragment	43		5	2	50
slab metate	20	1			21
basin metate	9	1	3		13
polishing/ hammerstone				1	1
comál	7				7
polishing stone				1	1
TOTAL	106	10	10	14	140

Materials used in the manufacture of ground stone tools included local quartzites, sandstones, basalts, and river cobbles of metamorphic and igneous origin. Modes of manufacture noted include shaping by pecking, flaking, and grinding. Pecking was also used to roughen grinding surfaces on manos and metates. Use wear was visible on a number of specimens and includes grinding, polish, striations, battering, and edge rounding. Hematite staining is common on milling stones from the House Locus.

Abraders

Three tools are classed as abraders, one from House 1 fill, one from Feature 14, and one from a test unit. Each of these tools is distinctive. Specimen .892 is a shaped sandstone object with a broad concavity ground on one end (Figure 7.16e). This concavity is 6 cm across and .5 cm deep, and would form a circle with a diameter in the 12-20 cm range. It appears to be a pole or beam smoother, but could also have been shaped to fit the diameter of a house support and used as a brace. The object fits well into one's palm, however, and would work well as a hand tool.

Specimen .2120 was retrieved from a test unit north of the House Locus in soils directly overlying Soil Unit 1, and thus is Early Archaic in context. It is a small pebble of pumice-like vesicular basalt, and has a single, flat ground facet on one surface (Figure 7.16c). Other than general smoothing or abrading, its function is unknown.

Specimen .2206 derives from Feature 14 fill and is a fragment of a thin, tabular piece of sandstone with the edge well-smoothed. The piece is 1.4 cm thick and resembles fragments of comáls or kitchen slabs, also recovered from the same feature. None of the other fragments display this edge grinding, however. Faint striations running parallel to the edge are visible. The function of the tool is not known.

Manos

Some 44 manos or mano fragments were recovered. While most of these are fragmentary, 11 are complete, or nearly so (Figure 7.17). Nineteen specimens display use on only a single surface, while 25 show use on both surfaces. Of these, eight were also used on ends or sides for hammering or other uses.

The manos are generally minimally ground, pecked, or pecked and ground into final shape, although some are well shaped and others are unshaped cobbles. Grinding is the predominant visible wear, but striations are visible on seven specimens. The ends of five specimens display battering, and the edges or ends of six display a smoothing or polish. Secondary functions include use as mauls or hammerstones (n=4), and possible use as a digging tool (n=1). Hematite staining occurs on two of the manos from House 1.

Metates

The 84 metate fragments recovered are classified into three categories based on degree of completeness and depth of the grinding surface. Metates complete enough to display a definite concavity of the grinding surface are classed as "basin metates". Those complete enough to definitely show a lack of a concavity on the grinding surface are "slab metates", or milling slabs. Specimens too fragmentary to tell are simply classed as metate fragments. The most complete of these metates are shown in Figures 7.18 and 7.19.

Slab metates are similar to the basin metates except that no concavity has been ground into the surfaces. Twenty-one specimens are in this category.

FIGURE 7.16

Manuports, abraders and wedge. (a) and (b) are manuports, river cobbles not native to the site area; surface modification and/or wear is not obvious. (c) and (e) are abraders; (c) is vesicular basalt, heavily ground on the surface facing the camera, (e) is a sandstone cobble with a ground concavity on the surface facing up, the long axis of the concavity extends from the upper right to lower left across this face. (d) is a large basalt wedge, the use edge or 'bit' is up in the photo with an edge angle of ca. 47°. Catalog numbers: a) 5EA799.735, b) 5EA799.737, c) 5EA799.2120, d) 5EA799.907, e) 5EA799.892.

FIGURE 7.17

A selection of the 44 manos and mano fragments recovered at the Yarmony Site. Catalog numbers: a) 5EA799.896, b) 5EA799.914, c) 5EA799.1689, d) 5EA799.908, e) 5EA799.1525, f) 5EA799.1688, g) 5EA799.1687.

FIGURE 7.18

Metate fragment: Part of a large sandstone metate, note the pecked surface (appears speckled in photo). Heavily ground shallow concavity extends to within 5 to 8 cm of upper edges, lower edge is broken through ground area. Light grinding and pecking occurs over nearly all of surface. Catalog number: 5EA799.2118.

FIGURE 7.19

Metate fragment: Part of a large sandstone metate. Slightly shaped by removal of large flakes and some grinding along the upper edge. Heavily ground concavity (ca. 1 cm deep) extends to within 6-9 cm of upper edge. Some pecking is in evidence but is nearly obliterated by grinding. Slab has been burned and cracked from heat. Catalog number: 5EA799.1686.

Metate fragments are simply pieces too small to be diagnostic of one of the above two types. Most pieces appear to be of slab metates, however. In arriving at the count of fragments, pieces that fit together were counted as one.

The primary wear type visible on metates is, of course, grinding, but polish is evident as well on 16 specimens, and striations are visible on the surface of 15 specimens. Hematite staining occurs on a total of 14 specimens. Three of these are from Feature 14, one is from Soil Unit 4 overlying House 2, and the other nine are from House 1 fill, two most likely in the House 2 midden, and six from the House 1 interior. One hematite stained basin metate was recovered from backdirt which originated in House 2 and was removed by the backhoe.

Polishing Stones

Two speckled igneous river pebbles appear to be smoothed or polished beyond what is natural. One of these shows light battering and was likely a light-duty hammerstone. The other lacks any additional wear. Both come from House 1 fill in a context that could be House 2 midden.

Manuports

Three items were identified as manuports, or items carried into the site, on the basis of their being non-local material. Two of these items are river pebbles, one phallus shaped and the other simply elongated (Figure 7.16a,b). Both could be polishing stones, but if so the wear is minimal. Both are from House 1 fill. The third item is a small ball of pyrite which was recovered from floor fill in House 1 (Figure 7.20a). This item measures just 2 cm in diameter. It is of unknown function.

Comáls or Kitchen Slabs

A number of thin, tabular sandstone fragments were recovered which resemble the tabular stones that are sometimes found associated with hearths in open sites. These stones are often called after their Spanish name, "comál", or simply referred to as kitchen slabs. Seven items were so classified at Yarmony, four from House 1 fill and three from Feature 14. It is quite likely that a number similar pieces were simply discarded as non-cultural during excavation.

Wedge

This single artifact is a large wedge-shaped piece of basalt which displays battering on its sharp edge as well as on the opposite flat dorsal surface (Figure 7.16d). The tool measures 12.8 cm in length, 9.2 cm in width, and is 7 cm thick and has an edge angle of about 55°. There is a faint residual staining of hematite on the tool. It was recovered from the floor fill of House 1. Use wear includes heavy battering and edge rounding. The tool could have functioned for heavy pounding, crushing or splitting.

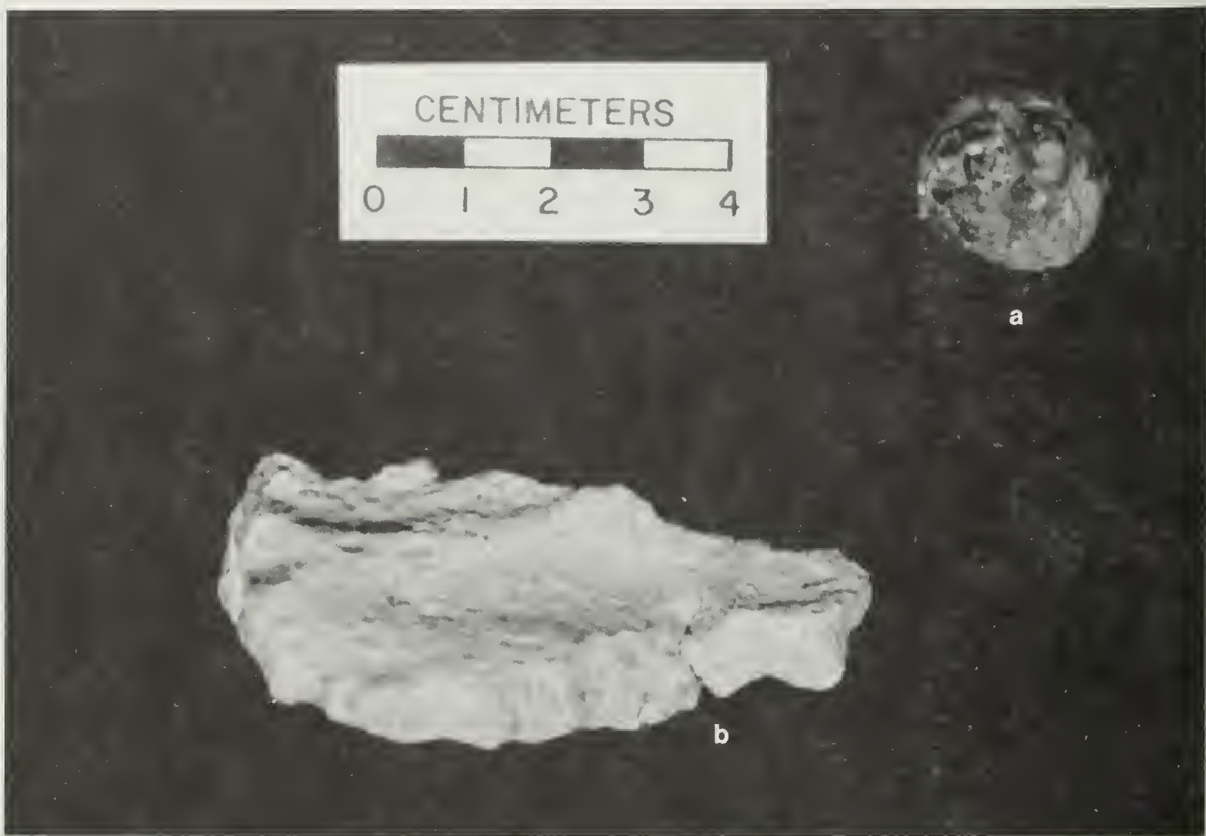


FIGURE 7.20

Pyrite ball and daub fragment. (a) is a small ball of crystalline pyrite, edges of the crystals and the rock itself appear worn, although this may be due to natural processes. (b) is one of several fragments of daub recovered from the floor of House 1, a stick impression appears as a linear concavity running the length of this specimen. Catalog numbers: a)5EA799.977, b) 5EA799.655.

Mineral Pigment

A number of tiny fragments of hematite and a few of limonite were observed during excavation in the House Locus. Five of these fragments were slightly larger, and were returned to the lab. All show signs of grinding. Residue from this grinding is evident on some of the milling implements described above. In fact, the amount of staining evident on these artifacts is highly suggestive of extensive use of these mineral pigments during Early Archaic use of the site.

Daub

Patches and globs of burned or oxidized clay were evident during excavations in House 1, but most of this material had melted into the soil matrix in the house. Several small pieces of baked clay or daub from the construction of the house were noted during excavation, and one exceptionally well preserved fragment was recovered (Figure 7.20b). This piece measures 7.8 cm in length, 4.4 cm at its widest point, and 2.6 cm thick. The impression of a stick is visible on one surface. An estimated diameter based on extending the arc of this impression is in the 4-6 cm range. The clay is tempered by an arkosic sand, and fizzes when dilute acid is applied. Its precise source has not been analyzed, but it could derive from local Unit 1 soil based on similar degrees of calcium carbonate content. McKibbin, who was on the excavation crews of both Yarmony and the Granby Site (Wheeler and Martin 1982) states that the Yarmony daub is very similar to, but less red in color than, that recovered at Granby.

Ceramics

Nineteen small potsherds were recovered from eroded surface and shallow subsurface contexts from an area termed the Ceramic Locus just north of the pit houses. Sherds from excavated contexts were universally in Unit 5 soils while those from the surface where in a game trail and shallow rills. These sherds are all of the same type, but there is sufficient range in thickness and interior treatment of individual sherds to cast some doubt on whether a single vessel is responsible for all of the sherds.

Sample: Nineteen sherds, including one neck sherd, no rims, all sherds very small, one or two vessels represented, one sherd fingernail impressed, all sherds have similar exterior treatment, same temper, most have smoothed interiors.

Provenience: surface and Soil Unit 5 in Ceramic Locus north of site datum

Illustration: Figure 7.21

Construction: undetermined, possibly coiled.

Core: Paste is fine with a hint of lamellar structure, very dark gray (N 3/0) to gray 5Y 5/1). Temper is subangular to subrounded fine to medium grained quartz sand with occasional feldspar crystals and other grains. One piece of burned fiber was observed in a single sherd. Temper size is variable, mostly smaller than 1 mm with largest grains in 2 mm size range. Temper is faintly visible on vessel exteriors, rarely visible on interiors.

Exterior Treatment: Exteriors are light grayish brown (2.5Y 6/2) with smoothed indentations that resemble obliterated cord markings or some other form of deliberate roughening (Figure 7.21a,b). The texture of this treatment

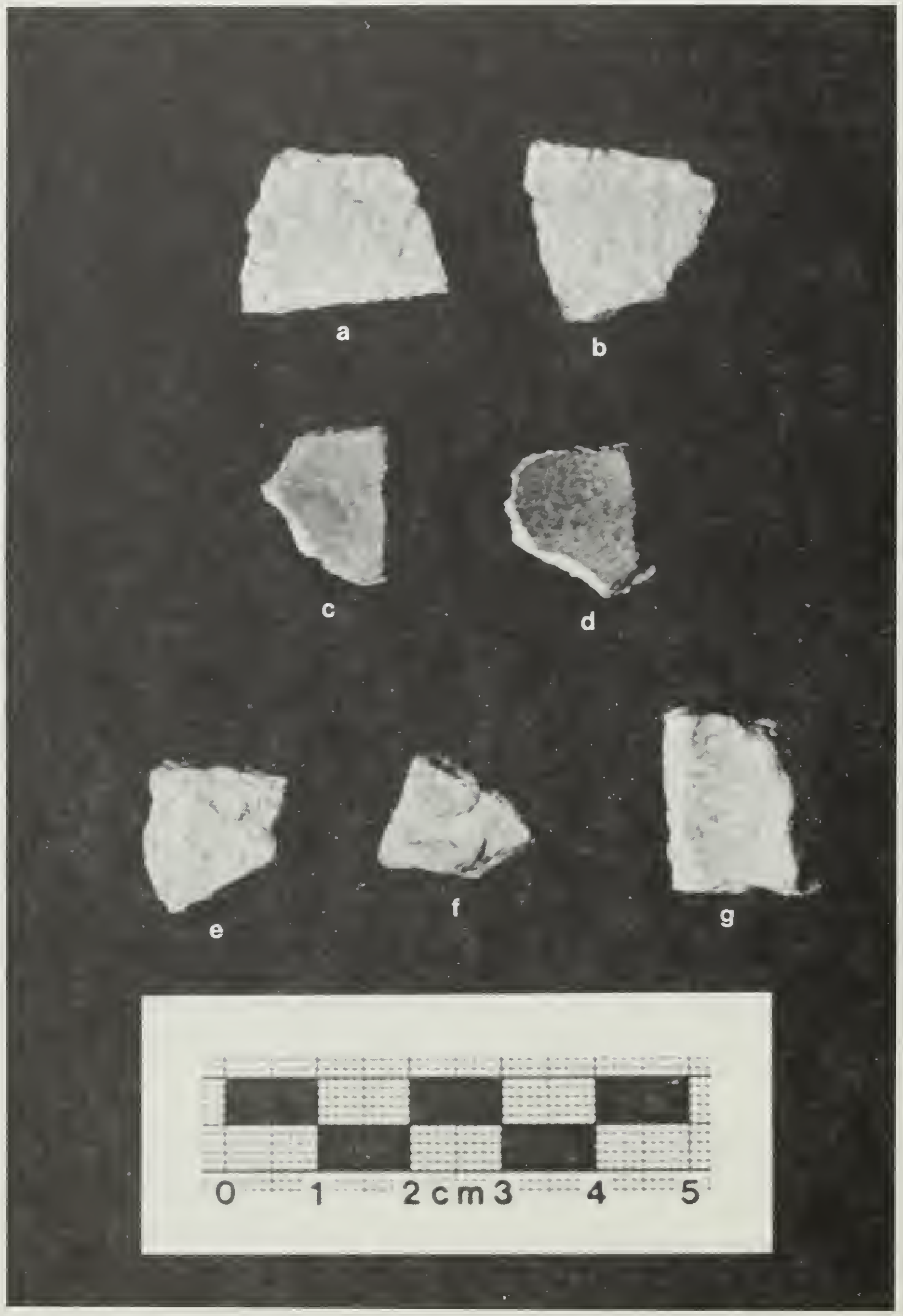


FIGURE 7.21

Examples of the ceramics recovered at the Yarmony Site. Obliterated cord impressions are faintly visible on (a) and (b), fingernail impressions are seen on (e) and (f), (g) is a neck sherd. Catalog numbers: a) 5EA799.889, b) 5EA799.83, c and d) surface provenience, e) 5EA799.1, f) 5EA799.1705, g) 5EA799.85.

is similar to that of a worn-out golf ball, except the dimples are quite shallow and not regular. Fingernail impressions occur on the exteriors of two sherds (Figure 7.21e,f). On one of these the ends of the nails lightly penetrate the sherd surface. On the other the impression was deep and a small fold of clay is scraped back from the nail mark to form small elevated crescents that resemble an applique. The sample is too small to tell what, if any pattern is formed by the nail impressions.

Interior Treatment: Interior surfaces of sherds are light grayish brown to gray (10YR 6/1), to dark gray (N 4/0). The interiors of all sherds are scraped, and all but two are also smoothed or polished.

Shape and Size: Undetermined, neck sherd indicates a jar (Figure 7.21g); smoothed and polished interiors are more characteristic of an open jar or bowl. Sherds cluster into two thickness ranges, 3.9-5.0 mm and 5.5-6.55 mm. Two sherds are thicker still - one of the decorated pieces (7.5 mm) and the neck sherd (9.3 mm). The largest sherd in the collection is just over 2 cm across.

A detailed analysis of these sherds has not been made, nor have they been compared side-by-side with other ceramic assemblages. In an earlier article on the Yarmony site, we speculated that these sherds might have Plains Woodland affiliations. This was based on the surface treatment that resembles obliterated cord markings, the 1230 BP date at the Soil Unit 4/5 contact, and the presence within the Ceramic Locus of a small, corner-notched projectile point. At that time, the fingernail-impressed sherd had not been found, and Madole's work on the stratigraphy was incomplete. With this additional sherd and the more detailed stratigraphic understanding there is now some question about this earlier speculation.

Madole is confident that the age of Soil Unit 5 is "much younger" than the 1230 BP date, based primarily on the lack of discernible soil development in the deposit. It is certain, however, based on excavation units in uneroded areas, that the sherds were deposited while this soil was accumulating. No datable features were found within this soil, and the shallow context of the sherds themselves was not favorable for thermoluminescent dating. Initially, the Woodland hypothesis seemed likely, but the suspected more recent age of the soil and the presence of clear fingernail impressions render this unlikely.

The strongest affiliation now appears to be with Fingertip-impressed variety of Uncompahgre Brown Ware (Buckles 1971:522), although the Yarmony sherds have far less of the vessel area covered by these decorations than is typical. Color, temper, fingernail impressions, the geographic position of the site within the traditional Ute range, and the apparent age of the sherds are all consistent with this interpretation. Benedict (1985:143) presents a detailed discussion of the recent literature on local pottery in connection with the plain and punctate ceramics from the Caribou Lake Site. He concludes that most of the fingertip- and stick-impressed pottery in Colorado comes from the mountain and plateau sections of the state, and that the non-micaceous varieties are representative of traditional Ute pottery prior to the influence in protohistoric time of micaceous wares from Taos and Picurís Pueblos in northern New Mexico.

It should be noted that the above interpretation is tentative. There is evidence in the Wyoming Basin for ceramics which are not Plains Woodland, but which date to the same early Late Prehistoric time period (Metcalf 1988). These

sherds range from buff to dark gray in color and are clearly distinct from later Intermountain Ware. Temper is usually sand and vessels are usually relatively thin and well-made. Some appear to be Fremont-influenced wares, but the sample is too small for this to be certain. Ceramics are found so seldom in the region as a whole, that the possibility of locally made "vernacular" pottery not part of any formal ceramic tradition must also be considered.

Bone and Antler Tools

A total of 29 pieces of bone, modified into tools or ornaments, were recovered from 5EA799. Each piece was analyzed separately on the basis of function as determined by wear patterns and overall tool morphology. Both patterned and unpatterned tools were recognized in this collection. Patterned items include awls and awl fragments, a single antler digging tool, and the decorative items. Unpatterned tools include fragments of bone tools which could not be further identified and fragments of butchered mammal bone used for specific tasks, such as scraping or cutting, then discarded.

Awls

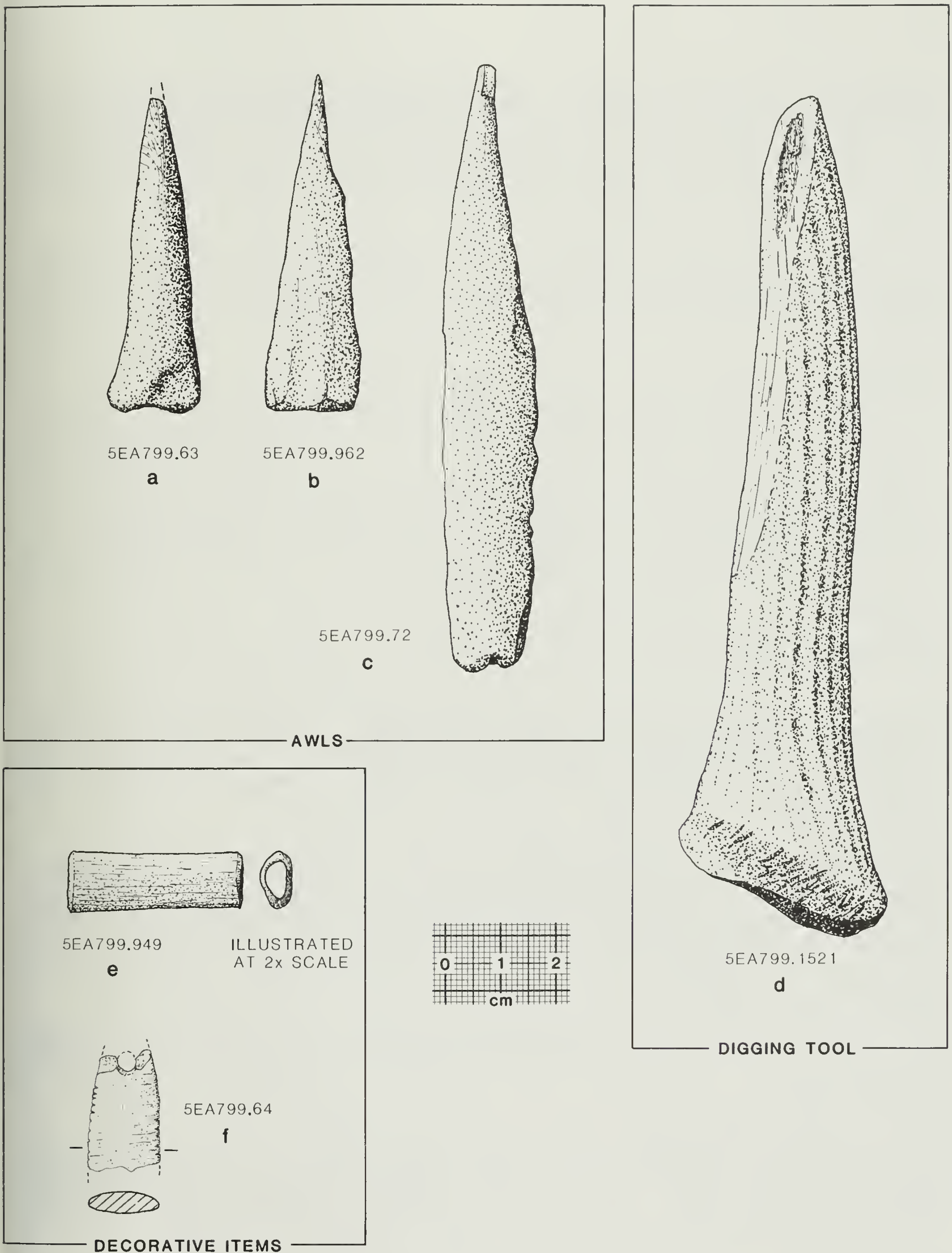
There are four complete bone awls and one probable bone awl fragment in the Yarmony collection. There are several small fragments of worked bone which may represent awl edge fragments, however further identification was not possible and these items are included with the unpatterned modified bone described below.

Specimen 5EA799.1743 is a long bone fragment from an elk/bison-sized animal. The awl is heavily striated along the lateral edges and the tip is slightly rounded. The tip and the lateral edges are heavily polished. This artifact is 66.3mm in length. Morphologically, this awl is larger and heavier than the other bone awls in the Yarmony collection. The striations along the lateral edges indicate heavy use. Since the tip of this awl is absent, it is unknown if the artifact had a blunt or sharp tip. The edges of the artifact which show heavy wear, may have been used in a rubbing motion perhaps on hides.

Specimen 5EA799.63 (Figure 7.22a) is an awl made from the proximal end of a deer metacarpal. The artifact is complete and measures 56 mm in length. Longitudinal striations are evident across the tip and the tip is highly polished. This awl was manufactured by splitting the metacarpal down the vascular groove, a common method in awl manufacture. Striations around the awl tip and along the shaft indicate it was used in both a rotary and thrusting fashion.

Specimen 5EA799.962 (Figure 7.22b) is also made from the proximal metacarpal of a deer. This awl is badly weathered but it is complete. The shape of this awl is triangular with the tip constricting to a long point. This constricted area is the result of use in a rotary fashion. The tip, although weathered, does exhibit one small area of extreme polish. A portion of the proximal articular surface of this artifact is present but is unmodified.

Specimen 5EA799.72 (Figure 7.22c) is a complete awl made from a long bone splinter, possibly a femur, from a large mammal. The tip exhibits longitudinal striations and is round in cross-section. The butt end of the tool is ground,



BONE TOOLS

FIGURE 7.22

rounded and exhibits a slight polish. There is a V-shaped notch cut into the butt end. The lateral margins of this awl display heavy use wear and polish. The longitudinal striations on the tip and lateral edges of this awl suggest its use in a thrusting motion. The wear patterns along the lateral edges are interesting in several respects. Both lateral edges exhibit heavy polish and both edges are sinuous indicating the edges of this awl were used as well as the tip.

Specimen 5EA799.951 is a metatarsal fragment from a deer-sized animal. A small portion of the posterior diaphysis shows polish. This item likely represents a portion of an awl.

Digging Tool

Specimen 5EA799.1521 (Figure 7.22d) is a complete and well preserved elk antler tine. This artifact is an antler tine and was broken from the main antler stem at its junction with the main antler stem. The tip is beveled and the flat portion of the antler tip shows considerable wear. There are vertical wear lines along the antler tine above the tip. The tine is 151 mm in length. Similar items are reported in the literature as antler flakers (Leach 1970:152). The specimen from Yarmony, however, does not exhibit wear from battering as one would expect on a flaker. The wear on the tip of this tool, as well as along the sides, suggests this artifact was used in a vertical motion as a digging implement.

Decorative Items

A total of nine pieces of worked bone serving a decorative function were recovered. Included are bead manufacturing debris, a complete bead, and pendant fragments. Decorative items are common in the worked bone assemblages of Archaic sites throughout the west. Bone beads and pendants have been recovered from Deluge Shelter, Cowboy Cave, and Sudden Shelter (Leach 1970; Lucius 1980; Plimpton 1980).

Specimens 5EA799.935 and .2201 are both proximal radii of jackrabbits (*Lepus townsendi*). Both exhibit groove-and-snap breaks below the proximal end. This type of break is common in bead manufacture. Specimen 5EA799.949 (Figure 7.22e) is a complete bead made from the long bone of a jackrabbit-sized mammal. This bead was ground on one facet and exhibits high polish. The grooved and snapped ends have been ground and smoothed. It is 16 mm in length.

Specimen 5EA799.941 is a bead fragment broken longitudinally and is missing one end. Like the complete bead described above, this one displays groove-and-snap manufacture on the intact end. This specimen measures 12 mm in length and was made from the long bone of a jackrabbit sized mammal.

Decorative items were also made from the bones and teeth of larger mammals. Specimen 5EA799.940 is a proximal radius of a canid, possibly a domestic dog (*Canis familiaris*). This element is burned and exhibits a groove-and-snap break along the proximal diaphysis. Another canid bone, specimen 5EA799.939, is a radius diaphysis fragment which has been ground on one end.

Three pendant fragments were recovered. Specimen 5EA799.965 is incomplete but retains part of a hole drilled in one end. The piece is missing one end and one lateral margin. It is burned, very highly polished, and is ground flat at the end near the hole, creating a right angle with the remaining margin. When whole, it was probably flat and rectangular in shape.

Specimen 5EA799.64 (Figure 7.22f) is not complete, but is an excellent example of early Archaic workmanship. It is wide and flat with what remains of a hole drilled in one end. Evenly-spaced grooves are incised down both edges, with very light diagonal lines discernible across both faces between the grooves. The end opposite the hole is snapped and the specimen is burned. This pendant is made from the rib of a large mammal.

The final pendant, specimen 5EA799.942, is made from an artiodactyla incisor. The incisor is split longitudinally and is grooved around one end.

Unpatterned Bone Tools

There are fifteen pieces of modified bone in the Yarmony collection which cannot be classified into specific tool categories. These are generally small bone fragments which one or more edges or faces display polish, striations or both.

Specimens .944, .953, .956 and .957 may represent pendant fragments similar to the ones described above. They are morphologically similar to specimen .965 - highly polished, ground flat and generally rectangular in shape - but lack any evidence of a suspension hole.

Specimens .946, .947, .950, .954, .958, .964 are all small fragments of worked bone. All exhibit polish and/or grinding evidence, but their small size and fragmentary nature prevents any further classification.

Several of these fragments may represent gaming pieces or fragments of worked bone serving a similar fashion. Gaming pieces, and incised bone, are common features of Archaic worked bone assemblages (Leach 1970; Plimpton 1980; Lucius 1980). Three additional fragments of worked bone are described below. These items reflect bone and antler fragments which were fragmented during butchering, utilized for a specific task, then discarded.

Specimen 5EA799.948 is an antler fragment, probably elk antler, which is fragmented longitudinally. Striations and polish are evident along one lateral edge. The striations are parallel to the long axis of the fragment suggesting its use as a rubbing tool.

Specimen 5EA799.963 is a fragment of a large mammal long bone, possibly a tibia. The bone was broken while fresh with one end exhibiting a stepped breakage pattern. One protruding edge exhibits extreme polish with the edge being worked into a point. Slight polish is noted around the broken edge but the main working edge was this small protruding edge. This tool may have been used as a borer, or at least in a similar fashion.

Specimen 5EA799.923 is another large mammal radius bone fragment. It shows polish along both lateral edges and one edge exhibits a sinuous polished

surface similar to that noted for specimen .72. Numerous striations along the polished edges suggest the tool was used in a lateral motion on a soft material.

Specimen 5EA799.959 is a small (15 mm) fragment of large mammal bone. The fragment is biconvex in cross-section and displays numerous striations along one face which run at an angle from the lateral edge. This tool may have been utilized as a scraping or cutting implement.

Overall, the collection of bone tools from the Yarmony site compares well with other Archaic assemblages in the west (Leach 1980; Lucius 1980; Plimpton 1980). Generally, there are several typical classes of bone tools with numerous types within each class. At Yarmony, awls, decorative items, and digging tools are the major classes with miscellaneous items making up the remainder of the collection. The collection reflects a wide range of activities being conducted, including leather work, digging, (digging storage cists, etc.), and the production of decorative items.

Table 7.8
Characteristics of Unhafted Bifaces

CAT #	STAGE	COMPONENT	COMPLETE	MATERIAL	EDGE 1			EDGE 2			REUSE
					Shape	Angle	Wear	Shape	Angle	Wear	
Blanks											
1948	1	F-14	yes	siltstone	cvx		nw	cvx		nw	no
1701	2	Soil 5 LP	near	Miocene ct	n/a			n/a			no
1741	1	Ceramic Locus	near	Miocene ct	irr		nw	n/a			no
Preforms											
25	4	House Locus	no	Miocene ct	cxser		nw	n/a			no
74	3	House Locus	yes	Miocene ct	cvx		nw	n/a			no
397	4	House Locus	yes	Miocene ct	cxser		nw	n/a			no
402	4	House Locus	no	Miocene ct	broken		n/a			no	
677	4	House Locus	no	Miocene ct	st		nw	n/a			no
1585	3	House Locus	no	Miocene ct	cvx		nw	broken		no	no
1587	4	House Locus	no	Miocene ct	broken		n/a			no	
1634	4	House Locus	no	Miocene ct	broken		n/a			no	
1637	4	House Locus	no	Miocene ct	irr		nw	n/a			yes
8	3	Soil 4 LA	no	Miocene ct	cvx		nw	n/a			no
47	3	Soil 4 EA?	no	Miocene ct	cvx		nw	n/a			no
676	3	Soil 4 LA?	no	Miocene ct	irr		nw	n/a			no
1542	4	Soil 4 LA	no	Miocene ct	irr		nw	n/a			no
828	4	Soil 5 LP?	yes	Moss Agate	cvx		nw	n/a			no
1512	3	Soil 5 LP?	no	Miocene ct	cvx		nw	n/a			no
44	4	Ceramic Locus	no	Miocene ct	st		nw	n/a			no
53	4	Soil 5 LP?	no	Miocene ct	cvx		nw	n/a			no
Bifacial Scrapers											
678	2	House Locus	yes	siltstone	st	55°	step	st	50°	attr	no
1675	2	House Locus	no	Miocene ct	irr	60°	ernd	n/a			no
1946	2	House Locus	no	Miocene ct	cvx	55°	ernd	n/a			no

Table 7.8 - Characteristics of Unhafted Bifaces

CAT #	STAGE	COMPONENT	COMPLETE	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	REUSE
Bifacial Scrapers (continued)											
628	3	House Locus	no	Miocene ct	irr	55°	ernd	n/a			yes
1733	3	House Locus	near	Miocene ct	irr	40°	attr	n/a			no
536	4	Soil 4 LA?	no	Miocene ct	irr	55°	attr	irr	45°	ernd	no
1514	2	Ceramic Locus	no	Miocene ct	cve	60°	step	n/a			no
1606	2	Soil 5 LP?	no	Miocene ct	irr	60°	ernd	st	50°	ecrsh	no
1952	2	Soil 5 LP?	no	Miocene ct	st	65°	ecrsh	n/a			yes
52	3	Soil 5 LP?	no	Miocene ct	st	65°	attr	n/a			no
2111	3	Soil 5 LP?	no	Miocene ct	st	55°	step	n/a			no
1603	4	Soil 5 LP?	no	Miocene ct	st	65°	ecrsh	irr	60°	step	no
Knives/Scrapers											
688	3	House Locus	yes	moss agate	cvx	40°	ecrsh	st	60°	attr	no
1878	4	F-14	no	Miocene ct	st	45°	ecrsh	st	62°	step	no
1881	3	LA	no	Miocene ct	cvx	55°	step	st	45°	ernd	no
46	3	LP	no	chalcedony	cve	40°	ecrsh	cvx	25°	attr	yes
Knife/Chopper											
829	2	Soil 4 LA?	no	Miocene ct	cvx	30°	ernd	n/a			no
Knife/Saw											
58	2	Soil 4 LA?	yes	coarse ct	st	55°	ernd	cvx	60°	NW	no
Knives											
298	3	House Locus	yes	Miocene ct	cvx	40°	ernd	n/a			yes
1600	3	House Locus	no	Miocene ct	cvx	30°	ernd	n/a			no
1677	3	House Locus	no	Miocene ct	st	40°	ernd	n/a			yes
1875	3	House Locus	no	siltstone	cvx	40°	ernd	n/a			no
17	4	House Locus	no	Miocene ct	cxser	45°	ernd	n/a			no

CAT #	STAGE	COMPONENT	COMPLETE	MATERIAL	EDGE 1			EDGE 2			REUSE
					Shape	Angle	Wear	Shape	Angle	Wear	
Knives (continued)											
28	4	House Locus	no	Miocene ct	broken			n/a			no
33	4	House Locus	no	Miocene ct	cxser			n/a			no
35	4	House Locus	no	maroon ct	cxser	35°	attr	n/a			no
59	4	House Locus	no	Miocene ct	broken			n/a			no
87	4	House Locus	yes	Miocene ct	st	30°	step	n/a			no
437	4	House Locus	no	Miocene ct	irr	35°	ecrsh	n/a			no
439	4	House Locus	no	Miocene ct	cxser			n/a			no
575	4	House Locus	no	Miocene ct	cxser	40°	ernd	n/a			no
592	4	House Locus	no	Miocene ct	stser			n/a			yes
710	4	House Locus	no	Miocene ct	stser			n/a			no
833	4	House Locus	no	Miocene ct	cvx	40°	attr	n/a			no
1515	4	House Locus	no	Miocene ct	stser			n/a			no
1569	4	House Locus	no	Miocene ct	stser			n/a			no
1602	4	House Locus	no	Miocene ct	st	40°	ecrsh	n/a			no
2109	4	House Locus	no	Miocene ct	st	45°	ernd	st	45°	ernd	no
2116	3	F-14	no	Miocene ct	st	45°	ernd	n/a			no
1871	4	F-14	no	maroon ct	cvx	40°	ecrsh	cvx	45°	attr	no
1882	4	F-14	no	Miocene ct	cvx	45°	step	cvx	45°	step	no
347	3	LA?	no	quartzite	cvx	40°	step	n/a			no
14	4	LA?	no	Miocene ct	stser			n/a			no
16	4	LA?	no	Miocene ct	stser			n/a			no
717	4	LA?	no	siltstone	st			n/a			no
831	4	LA?	no	Miocene ct	stser	45°	ernd	n/a			no
1549	4	LA?	no	Miocene ct	stser			n/a			no
1551	4	LA?	no	Miocene ct	stser	40°	ernd	n/a			no
1655	4	LA	no	Miocene ct	cvx	30°	ernd	n/a			no
1718	4	LA	no	Miocene ct	cxser		ecrsh	sercv		step	no
2113	3	LP	no	quartzite	cvx	45°	ecrsh	cvx	45°	ecrsh	no
468	4	LP?	no	Miocene ct	broken			n/a			no
760	4	LP?	no	Miocene ct	stser	35°	step	n/a			no
826	4	LP?	no	Miocene ct	stser	35°	step	n/a			no
860	4	LP	no	Miocene ct	stser	35°	step	n/a			yes

Table 7.8 - Characteristics of Unhafted Bifaces

CAT #	STAGE	COMPONENT	COMPLETE	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	REUSE
Knives (continued)											
1516	4	LP	no	Miocene ct	stser			n/a			no
1558	4	LP?	no	Miocene ct	cxser	40°	pol	n/a			no
1599	4	LP?	no	Miocene ct	cxser	35°	ernd	n/a			no
1951	4	LP?	no	Miocene ct	cvx	45°	ernd	n/a			no
1645	4	Ceramic Locus	no	Miocene ct	cvx	40°	ernd	n/a			yes
Awls											
431	4	House Locus	no	Miocene ct	stser	40°	ernd	n/a			no
54	4	LA?	near	Miocene ct	cvx	55°	ernd	n/a			no
Borer											
60	3	House Locus	yes	Miocene ct	cvx	55°	ernd	n/a			no
Chopper											
1510	2	House Locus	no	Miocene ct	cvx	55°	batt	n/a			no
Fragments											
18	4	House Locus	no	Miocene ct	stser	50°	ernd	n/a			yes
1552	4	LA?	no	Miocene ct	broken		n/a			no	
1869	4	House Locus	no	Miocene ct	st	45°	nw	st	45°	nw	no
1947	4	House Locus	no	Miocene ct	stser	35°	nw	n/a			no
2114	4	House Locus	no	Miocene ct	stser	45°	nw	stser	45°	nw	no

KEY

COMPONENT:
LA = Late Archaic
LP = Late Prehistoric

EDGE 1 and EDGE 2:

Shape:
cve = concave
cvx = convex
cxser = convex serrated
irr = irregular
n/a = not applicable
ser = serrated
sercv = serrated
st = straight
stser = straight serrated

MATERIAL:
ct = chert (e.g. Miocene ct)

Angle is shown in degrees (where applicable).

Wear:
attr = attrition
batt = battered
ernd = edge rounding
ecrsh = edge crushing
nw = no wear
pol = polished
step = step fracture

Table 7.9
Characteristics of Flake Tools

CAT #	COMPONENT	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	EDGE 3 Shape	EDGE 3 Angle	EDGE 3 Wear	USED EDGE COMMENTS
Utilized Flake Perforator												
1572	LA?	Miocene ct	cvx	50^{o}	ernd							projection utilized
Shaped Perforator/Scrapers												
57	House Locus	Miocene ct	st	70^{o}	attr	st	65^{o}	ecrsh	cvx	60^{o}	ernd	projection, edges retouched
70	House Locus	agate	cvx	60^{o}	step	cvx	65^{o}	ecrsh	cvx	35^{o}	attr	spurred scraper
49	LP?	moss agate	cvx	45^{o}	ecrsh	st	60^{o}	attr	st	60^{o}	step	projection retouched
Shaped Drills												
65	House Locus	moss agate	cvx	55^{o}	step	irr	60^{o}	attr				projection retouched
822	House Locus	agate	cvx	25^{o}	nw	cvx	40^{o}	nw	cvx	45^{o}	ecrsh	retouched haft and projection
Utilized Flake Cutting Tools												
633	House Locus	Miocene ct	cvx	45^{o}	ernd							lateral edge
834	House Locus	Miocene ct	st	25^{o}	attr							also attr, distal
1580	House Locus	Miocene ct	cvx	30^{o}	attr	st	25^{o}	ernd				lateral
1583	House Locus	moss agate	rec	30^{o}	attr							distal
1588	House Locus	Miocene ct	st	30^{o}	attr							lateral
1636	House Locus	Miocene ct	cvx	20^{o}	attr	st	25^{o}	attr	cve	20^{o}	attr	distal and lateral
1642	House Locus	Miocene ct	rec	30^{o}	attr							lateral
1658	House Locus	siltstone	st	35^{o}	attr							lateral
1679	House Locus	Miocene ct	cvx	35^{o}	attr							lateral
1885	F-14	Miocene ct	cve	25^{o}	attr	st	40^{o}	attr				alternate lateral
1538	LA	Miocene ct	st	20^{o}	attr							lateral
1590	LA?	Miocene ct	cvx	25^{o}	attr							lateral

Table 7.9 - Characteristics of Flake Tools

CAT #	COMPONENT	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	EDGE 3 Shape	EDGE 3 Angle	EDGE 3 Wear	USED EDGE COMMENTS
Utilized Flake Cutting Tools (continued)												
1649	LA?	Miocene ct	cvx	25°	ecrsh							also attr, lateral
76	LP	Miocene ct	st	25°	attr							lateral
Minimally Retouched Cutting Tools												
1534	House Locus	Miocene ct	st	35°	attr							also ecrsh, lateral
1854	House Locus	Miocene ct	rec	40°	step							also pol, lateral
1617	House Locus	Miocene ct	cvx	20°	ernd							also attr, lateral
1877	F-14	Miocene ct	cve	45°	step	cve	45°	ernd				also pol, collateral
1537	LA	Miocene ct	irr	30°	ernd							also attr, step, lateral
1562	LP	gray ct	irr	40°	ecrsh	st	40°	attr				lateral
1638	LP	Miocene ct	rec	25°	attr							lateral
Edged Cutting Tools												
221	House Locus	siltstone	st	30°	attr							also ernd, lateral
651	House Locus	Miocene ct	cve	40°	attr							also ecrsh, lateral
1513	House Locus	moss agate	stser	30°	ernd							also attr, distal
1546	House Locus	Miocene ct	cve	30°	attr							lateral
1582	House Locus	moss agate	st	30°	pol							also ernd, lateral
349	LA?	Miocene ct	stser	45°	nw							lateral, bifacial retouch
1517	LA?	Miocene ct	irr	40°	attr							also step, lateral
1614	LA?	Miocene ct	irr	30°	ernd							also attr, lateral
2112	LA?	Miocene ct	cvx	35°	step	cvx	45°	step				proximal, collateral
51	LP	Miocene ct	cxser	30°	ernd							lateral
445	LP?	moss agate	cvx	35°	ernd							also ecrsh, lateral
1641	LP	Miocene ct	rec	30°	ernd	st	15°	attr				lateral

Table 7.9 - Characteristics of Flake Tools

CAT #	COMPONENT	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	EDGE 3 Shape	EDGE 3 Angle	EDGE 3 Wear	USED EDGE COMMENTS
Utilized Microflake												
1543	LA	Miocene ct	st	60°	attr	cvx	30°	attr				distal-lateral, non-local material
281	LP-CL	Miocene ct	cvx	20°	attr							also ecrsh, lateral
1742	LP	maroon ct	st	30°	attr							lateral
Minimally Retouched Microflakes												
1533	House Locus	Laney ct	cve	50°	attr							distal
1568	House Locus	siltstone	irr	50°	ernd							also attr, distal
1597	House Locus	Miocene ct	cvx	55°	ecrsh							also attr, distal
Utilized Flake Composite Tools												
1644	House Locus	Miocene ct	cvx	50°	attr	st	35°	attr	cve	35°	attr	distal-lateral
1575	LP?	Miocene ct	st	50°	attr	cvx	70°	step				utilized projection
Minimally Retouched Flake Composite Tools												
1545	House Locus	Miocene ct	irr	60°	ernd	cvx	65°	ecrsh				proximal-lateral, plane
1570	House Locus	speckled ct	cvx	30°	ernd	st	35°	attr				lateral
1577	House Locus	Miocene ct	irr	25°	attr	cvx	20°	attr	cvx	40°	step	lateral
1609	House Locus	Miocene ct	st	25°	ernd	irr	65°	ecrsh				distal-lateral
1657	House Locus	Miocene ct	irr	40°	ernd	st	20°	attr				lateral
1950	House Locus	maroon ct	rec	70°	attr							also pol, step, lateral
1870	F-14	Miocene ct	cvx	45°	attr							also step, lateral
1880	LP?	Miocene ct	st	40°	attr	st	40°	attr	cvx	20°	attr	also pol, distal-collateral
Edged Flake Composite Tools												
68	House Locus	Miocene ct	cvx	35°	ecrsh	cve	70°	step	cvx	75°	step	distal-lateral
69	House Locus	Miocene ct	stser	25°	ernd	st	40°	attr				lateral, blade tool
88	House Locus	Miocene ct	cve	65°	ecrsh	irr	45°	batt	st	70°	nw	distal-notch

Table 7.9 - Characteristics of Flake Tools

CAT #	COMPONENT	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	EDGE 3 Shape	EDGE 3 Angle	EDGE 3 Wear	USED EDGE COMMENTS
Edged Flake Composite Tools (continued)												
89	House Locus	agate	cvx	45°	step	cvx	30°	attr	cvx	30°	attr	projection, alternate edges
425	House Locus	moss agate	irr	35°	attr	st	40°	ernd				distal-lateral, blade tool
583	House Locus	Miocene ct	st	50°	step	cvx	40°	ernd				lateral
821	House Locus	siltstone	stser	45°	attr	rec	40°	ernd				projection, lateral
823	House Locus	Miocene ct	irr	55°	step	cvx	45°	ernd				lateral
835	House Locus	Miocene ct	cvx	65°	ecrsh	irr	40°	ernd				lateral, alternate edges
855	House Locus	Miocene ct	cvx	50°	attr	irr	45°	attr				projection, lateral
1535	House Locus	agate	cvx	45°	attr	cve	25°	attr				distal-notch
1540	House Locus	moss agate	cve	30°	attr	cvx	70°	attr	cve	50°	ernd	projection, lateral
1571	House Locus	Miocene ct	rec	25°	ernd	rec	35°	attr				lateral
1576	House Locus	Miocene ct	st	50°	ecrsh	cve	55°	attr				lateral-notch
1586	House Locus	gray ct	rec	55°	attr	st	40°	attr	cvx	50°	attr	Edge 4-cvx, 60°, projection
1591	House Locus	Miocene ct	st	40°	attr	irr	30°	ecrsh	st	45°	ernd	Edge 4-cve, 20°, notch
1592	House Locus	Miocene ct	irr	40°	ernd	st	45°	step				lateral, alternate edges
1598	House Locus	Miocene ct	irr	50°	step	cvx	45°	ernd	st	30°	step	projection, alternate edges
1613	House Locus	moss agate	cvx	25°	ecrsh	st	65°	attr				distal-lateral
1621	House Locus	Miocene ct	st	60°	ernd	cve	60°	ecrsh				lateral, notch
1624	House Locus	Miocene ct	cve	40°	ecrsh	rec	40°	ernd				lateral
1625	House Locus	Miocene ct	cve	30°	attr	cvx	55°	ernd	cvx	55°	ernd	projection, lateral
1652	House Locus	Miocene ct	cvx	40°	ecrsh	rec	35°	attr	st	30°	attr	projection, lateral
1661	House Locus	Miocene ct	dent	30°	attr	cve	50°	attr				lateral
1662	House Locus	Miocene ct	rec	30°	attr	cvx	45°	ernd				projection, lateral
1663	House Locus	Miocene ct	st	60°	attr	cvx	35°	ernd				projection, lateral
1664	House Locus	moss agate	cve	50°	attr	cvx	60°	nw	cve	55°	ecrsh	Edge 4-cve, 50°, notch
1672	House Locus	Miocene ct	rec	65°	ecrsh	cvx	30°	attr	irr	30°	attr	Edge 4-cvx, 70°, attr
1717	House Locus	Miocene ct	stser	35°	step	cve	45°	attr				lateral
1949	House Locus	Miocene ct	cvx	55°	step	beak	40°	attr	st	55°	attr	lateral and corner
2115	F-14	Miocene ct	cvx	45°	attr	cvx	55°	attr				proximal-collateral
55	LA?	Miocene ct	rec	30°	step	cve	40°	attr	st	60°	ecrsh	lateral, notch
71	LA?	Miocene ct	stser	35°	ecrsh	st	60°	attr	cvx	40°	attr	distal-lateral
1574	LA	Miocene ct	st	45°	step	cvx	60°	ernd				projection; blade tool
1579	LA?	Miocene ct	cve	20°	attr	cvx	50°	attr				projection, notch

Table 7.9 - Characteristics of Flake Tools

CAT #	COMPONENT	MATERIAL	EDGE 1			EDGE 2			EDGE 3			USED EDGE COMMENTS
			Shape	Angle	Wear	Shape	Angle	Wear	Shape	Angle	Wear	
Edged Flake Composite Tools (continued)												
1608	LA?	Miocene ct	cve	35°	ernd	st	50°	step				lateral
1[illegible]15	LA?	Miocene ct	rec	75°	step	cve	50°	ecrsh	cvx	50°	attr	projection, notch
50	LP?	Miocene ct	cve	45°	nw	cvx	50°	ernd	st	50°	ecrsh	distal-notch, non-local
824	LP?	Miocene ct	cvx	60°	step	burin	50°	ecrsh				projection, lateral
1596	LP?	Miocene ct	st	55°	ernd	st	40°	attr				lateral
1607	LP	gray ct	st	55°	step	cve	55°	ecrsh	cvx	55°	ernd	lateral, notch
1610	LP?	Miocene ct	cve	60°	attr	cvx	60°	ernd				projection, notch
1627	LP?	Miocene ct	cvx	55°	attr	cve	55°	ecrsh	st	60°	ernd	projection, notch
2110	LP?	Miocene ct	st	40°	attr	st	40°	step				collateral
Resharpening Flake Tools												
357	House Locus	Miocene ct	irr	45°	ecrsh							from biface
825	House Locus	Miocene ct	st	40°	step							also ecrsh, from biface
45	LA	Miocene ct	cvx	35°	attr							also step, from biface
Utilized Flake Scraping Tools												
784	House Locus	Miocene ct	irr	45°	step							also ecrsh, lateral
1560	House Locus	Miocene ct	st	75°	step							also ecrsh, lateral
1601	House Locus	Miocene ct	st	55°	attr							lateral
1623	House Locus	Miocene ct	cve	70°	ecrsh	st	50°	pol				proximal-distal
1651	House Locus	Miocene ct	st	45°	attr							lateral, alternate edges
1680	House Locus	Miocene ct	st	65°	ecrsh	st	35°	attr				lateral
2117	F-14	Miocene ct	rec	45°	step	rec	45°	step				also attr, collateral
2202	F-14	rhyolite	rec	55°	attr							lateral
2203	F-14	basalt	st	45°	attr							lateral
333	LA?	Miocene ct	cve	45°	attr							distal

			EDGE 1			EDGE 2			EDGE 3			
CAT #	COMPONENT	MATERIAL	Shape	Angle	Wear	Shape	Angle	Wear	Shape	Angle	Wear	USED EDGE COMMENTS
Minimally Retouched Flake Scraping Tools												
799	House Locus	Miocene ct	irr	65°	step	irr	40°	ernd				lateral
1605	House Locus	Miocene ct	st	70°	ecrsh							also attr, distal
1626	House Locus	Miocene ct	st	65°	ecrsh							also attr, lateral
1630	House Locus	Miocene ct	irr	60°	ecrsh	irr	65°	attr				distal-lateral
1633	House Locus	Miocene ct	cve	75°	attr							proximal
1648	House Locus	Miocene ct	cvx	70°	attr							distal
1650	House Locus	moss agate	st	50°	attr	cve	60°	attr	cvx	50°	ecrsh	distal-lateral
1656	House Locus	Miocene ct	cvx	40°	step	cvx	40°	ecrsh	irr	50°	attr	distal-lateral
1669	House Locus	Miocene ct	irr	40°	attr	cvx	70°	attr				distal-lateral
1584	House Locus	Miocene ct	cvx	50°	attr	cvx	55°	attr				distal-lateral
1555	LA?	Miocene ct	cvx	60°	attr							lateral
1578	LA?	Miocene ct	st	65°	step							also ecrsh, lateral
1536	LP?	Miocene ct	st	45°	attr							distal
1553	LP	Miocene ct	irr	45°	step							also ecrsh, lateral
1554	LP	moss agate	st	55°	attr	irr	45°	nw				lateral
1681	LP-CL	Miocene ct	cvx	70°	pol							also ernd, distal
Edged Flake Scrapers												
56	House Locus	Miocene ct	cvx	60°	attr							also step, distal
67	House Locus	Miocene ct	st	60°	attr	cvx	40°	ernd	cvx	55°	ecrsh	Edge 4-st, 35°, ecrsh
355	House Locus	Miocene ct	irr	60°	attr							lateral
371	House Locus	Miocene ct	irr	60°	attr							proximal
622	House Locus	moss agate	rec	35°	ecrsh	rec	50°	ernd				lateral
704	House Locus	Miocene ct	cvx	50°	attr							also ernd, step, lateral
832	House Locus	speckled ct	cve	65°	attr							also step, lateral
863	House Locus	Miocene ct	irr	45°	attr							also ecrsh, lateral
1556	House Locus	Miocene ct	st	65°	attr							also step, lateral
1557	House Locus	Miocene ct	irr	50°	attr							also step, ecrsh, lateral
1563	House Locus	Miocene ct	cve	55°	step							also ecrsh, lateral
1567	House Locus	Miocene ct	dent	55°	ecrsh							also attr, lateral
1581	House Locus	Miocene ct	dent	60°	ecrsh							also attr, lateral

CAT #	COMPONENT	MATERIAL	EDGE 1 Shape	EDGE 1 Angle	EDGE 1 Wear	EDGE 2 Shape	EDGE 2 Angle	EDGE 2 Wear	EDGE 3 Shape	EDGE 3 Angle	EDGE 3 Wear	USED EDGE COMMENTS
Edged Flake Scrapers (continued)												
1589	House Locus	Miocene ct	st	55°	attr	irr	50°	ecrsh				distal-lateral
1593	House Locus	Miocene ct	cve	65°	attr							lateral
1595	House Locus	dk gray ct	st	55°	step	cvx	70°	ecrsh				distal-lateral
1604	House Locus	Miocene ct	st	45°	step							also attr, lateral
1616	House Locus	moss agate	st	50°	ecrsh							distal-lateral
1618	House Locus	Miocene ct	irr	85°	ecrsh	cve	65°	attr				proximal-lateral
1620	House Locus	Miocene ct	irr	90°	step	cve	60°	ecrsh				distal-lateral
1628	House Locus	Miocene ct	rec	65°	ernd							lateral
1629	House Locus	Miocene ct	cve	70°	ecrsh							also step, lateral
1631	House Locus	Miocene ct	irr	45°	attr	st	60°	ecrsh				distal-lateral
1632	House Locus	speckled ct	cve	65°	attr							distal
1635	House Locus	Miocene ct	stser	65°	ecrsh							also attr, step, lateral
1639	House Locus	moss agate	irr	50°	ecrsh							also attr, lateral
1643	House Locus	Miocene ct	rec	60°	step							also ecrsh, lateral
1654	House Locus	gray ct	cve	50°	attr							distal
1659	House Locus	Miocene ct	st	55°	ecrsh	st	35°	ernd				distal-lateral
1666	House Locus	Miocene ct	irr	50°	ernd							also step, distal
1668	House Locus	moss agate	irr	40°	step							also attr, lateral
1670	House Locus	Miocene ct	cve	70°	attr							lateral
1671	House Locus	Miocene ct	st	60°	ecrsh							also attr, step, lateral
1674	House Locus	Miocene ct	dent	55°	attr							proximal
1676	House Locus	Miocene ct	cvx	35°	nw							distal
1735	House Locus	Miocene ct	st	45°	attr	cvx	50°	ecrsh				distal-lateral
1872	F-14	Miocene ct	rec	65°	attr							lateral
58	LA?	coarse ct	st	55°	ernd	cvx	60°	nw				lateral
61	LA?	Miocene ct	st	40°	attr	irr	40°	attr				lateral
348	LA?	Miocene ct	st	60°	attr							also step, lateral
810	LA?	moss agate	irr	65°	attr							also ecrsh, lateral
1539	LA?	Miocene ct	cve	55°	ernd							also attr, lateral
1544	LA?	Miocene ct	stser	55°	ernd							also attr, lateral
1559	LA?	Miocene ct	cvx	55°	ernd							also attr, lateral
1594	LA?	Miocene ct	st	60°	attr	cvx	60°	ecrsh				lateral

Table 7.9 - Characteristics of Flake Tools

CAT #	COMPONENT	MATERIAL	EDGE 1			EDGE 2			EDGE 3			USED EDGE COMMENTS
			Shape	Angle	Wear	Shape	Angle	Wear	Shape	Angle	Wear	
Edged Flake Scrapers (continued)												
1640	LA?	Miocene ct	irr	65°	attr	rec	50°	step	irr	60°	ecrsh	Edge 4-rec, 60°, step
1653	LA?	Miocene ct	cve	45°	attr	cve	45°	ecrsh				lateral
1660	LA?	yel-brn ct	stser	55°	ernd							also step, attr, lateral
1532	LP-CL	Miocene ct	st	55°	attr							lateral
1548	LP	Miocene ct	cve	50°	ecrsh	st	40°	attr				lateral
1550	LP-CL	Miocene ct	st	55°	nw							lateral
1561	LP?	siltstone	cvx	50°	ernd							also attr, lateral
1567	LP-CL	Miocene ct	st	60°	attr							lateral
1665	LP?	Miocene ct	cve	60°	ecrsh	irr	55°	step				lateral
1874	LP?	Miocene ct	rec	45°	step							too fragmentary
Shaped Scrapers												
48	Road Cut	red-brn ct	cvx	65°	attr	cvx	70°	ecrsh	cvx	70°	ernd	also step, distal-lateral
1541	Road Cut	Miocene ct	cvx	60°	ernd	st	70°	attr				distal-lateral
90	House Locus	Miocene ct	cvx	65°	attr	irr	65°	step	cvx	50°	ernd	distal-lateral
608	House Locus	Miocene ct	st	60°	ernd	cvx	60°	attr				distal-lateral
657	House Locus	Miocene ct	cvx	50°	ernd							also attr, step, distal
1619	House Locus	moss agate	irr	50°	ecrsh	cvx	50°	step				distal-lateral
1646	House Locus	Miocene ct	cvx	50°	ernd	cvx	55°	step				distal-lateral
1873	House Locus	Miocene ct	cvx	55°	attr							also pol, distal
62	LA?	moss agate	cvx	50°	ernd							distal, lateral
Shaped Spokeshaves												
1698	LA?	Miocene ct	st	75°	ecrsh							also step, lateral
1547	LP	Miocene ct	cve	55°	ecrsh							also attr, notch

Table 7.9 - Characteristics of Flake Tools

			EDGE 1			EDGE 2			EDGE 3			
CAT #	COMPONENT	MATERIAL	Shape	Angle	Wear	Shape	Angle	Wear	Shape	Angle	Wear	USED EDGE COMMENTS
Retouched Flake Gravers												
761	House Locus	Miocene ct	burin	60°	ernd							projection retouched
1573	House Locus	agate	cvx	40°	attr							projection
1673	House Locus	Miocene ct	cvx	20°	ernd							also attr, projection
1611	LP?	moss agate	cvx	25°	ecrsh							also step, attr, projection
Shaped Graver-Scraper												
73	LA?	moss agate	cvx	70°	attr	cvx	70°	ecrsh				projection, lateral
Wedge												
66	House Locus	igneous	irr	25°	attr							distal

KEY

COMPONENT:
LA = Late Archaic
LP = Late Prehistoric
? = artifact from fill above houses

EDGE 1, EDGE 2, and EDGE 3:

Shape:
cve = concave
cvx = convex
cxser = convex serrated
dent = denticulate
n/a = not applicable
irr = irregular
rec = recurvate
st = straight
stser = straight serrated

MATERIAL:
ct = chert (e.g. Miocene ct)
dk = dark (e.g. dk gray)
red-brn = red-brown
yel-brn = yellow-brown

Angle is shown in degrees (where applicable).

Wear:
attr = attrition
batt = battered
ernd = edge rounding
ecrsh = edge crushing
nw = no wear
pol = edge polish
step = step fracture

CHAPTER 8

ARCHAEOFAUNA FROM THE YARMONY SITE

by Ronald J. Rood

Introduction

The 1987 and 1988 excavations at the Yarmony site, 5EA799, produced a large quantity of faunal material. This collection provides some important data on aboriginal faunal utilization in the high country and the collection is especially important since faunal remains are not generally preserved in mountain soils. Bone was preserved especially well from 5EA799 for a variety of reasons. Perhaps the most important of these is the fact that the bone was preserved in pit house fill where it was protected from chemical weathering agents present in the native soil. Bone preservation was not as good in test pits excavated outside of the house features. Some evidence of weathering and canid gnawing was noted on the bone but non-cultural modifications to the collection are considered to be minor.

A total of 2342 mammal, bird, and fish bones was recovered from the Yarmony site. Most of this bone was recovered from ¼" screen during the field excavation. A sizeable quantity of small unidentifiable fragments and the fish elements was recovered from water-screened sample taken from various places throughout the excavation.

Faunal material was recovered from eight separate archaeological components at 5EA799. The vast majority of the sample (over 80%) is associated with the Early Archaic component of House 1. This component produced 1877 bones. Other Early Archaic components include the Early Archaic House 2, the East Road Cut, and Feature 14. Minor amounts of faunal material were recovered from the Late Prehistoric and Late Archaic components on the site. A total of 19 bones could not be assigned to specific archaeological components. These were either placed into a "disturbed" or "unknown" category depending upon the provenience.

The collection of faunal material from 5EA799 is highly fragmented and only a very small percentage of the total collection could be identified to the level of genus. Of the total, only 253 bones or 12.1% of the entire collection could be identified. This is characteristic of highly fragmented collections and the reasons for this will be presented in a later section of this chapter. In the 253 identifiable bones a wide array of species are represented. All of the mammalian, avian, and fish species identified from the site could be obtained within a very short distance from the site itself. No exotic species were identified and no environmental change is reflected in the faunal sample.

The six recognized archaeological components at Yarmony represent three areas where faunal remains accumulated or were discarded. These include discrete activity areas where faunal materials were processed (East Road Cut, Feature 14), pit house fill, which represents midden deposits (House 1 and House 2), and

scattered cultural occupations (the Late Prehistoric and Late Archaic occupations). In all three of these areas, faunal remains were subjected to differential cultural and natural factors which have to some degree, altered the sample. Changes and consistencies in faunal utilization can be observed in the sample from Yarmony, however these changes must be viewed with caution and with regard to the natural and cultural factors inherent in the collection. Natural factors such as weathering, mineralization, and canid modification have not seriously effected the faunal material from Yarmony. Cultural factors in how the bone was processed and discarded remains as the most critical factor in understanding the faunal remains from this site.

Methods

All identifications were made by the author using comparative skeletons. Faunal identification manuals, namely those by Gilbert (1980), Gilbert *et al.* (1981), Lawrence (1951), and Brown and Gustafson (1979), were consulted on a regular basis throughout the analysis to gain insight on the elements under question. The bison elements were identified using the comparative collections at the University of Wyoming, Laramie and several other elements were confirmed by the collections at Laramie. The dog mandibles and the fetal bone were examined by Dr. Danny Walker of the University of Wyoming. The fish elements were examined by Dr. W.L. Minckley of Arizona State University.

A goal in faunal analysis is to be right every time with every identification, or at the least "we must strive for the closest approximation to the truth that is possible" (Lyman 1982:355). With a highly fragmented collection such as this one, this can be frustrating. My approach is a cautious one following in part the "levels of identifiability concept" described by Lyman (1979). All of the faunal material is assigned to categories based upon how much information can be obtained from a particular fragment of bone. Generally, bone fragments, at the least, can be assigned to broad categories simply as "mammal" or "large mammal" to name but two. In this analysis, several categories were used to classify the bone fragments which could not be identified with 100% certainty. Most of the fragments which could not be identified are small pieces resulting from aboriginal bone grease production and marrow extraction.

The categories used in this analysis are as follows:

Unidentifiable: These are bones which cannot be identified. In this analysis, all of the unidentifiable bones were recovered from water-screened samples and represent very tiny fragments. It could not be determined if mammal or bird bone was represented.

Unidentifiable Small Mammal: Bone assigned to this category is from mammals the size of mice or voles. Again these are fragmented, preventing specific identifications.

Unidentifiable Medium Mammal: In this analysis, medium-sized mammals are in the size range of rabbits, hares, marmots, and large ground squirrels. Much of the bone recovered from Yarmony was assigned to this category and it is characteristic of bone marrow and grease procurement. In some instances the element could be determined, but, in most cases, bone assigned to this category represents long bone diaphysis fragments.

Unidentifiable Large Mammal: Bone assigned to this category consists of fragments from animals in the size range from deer to bison. Due to the fragmentary nature of the bone, further identification was not possible.

Unidentifiable Large Bird: Only one bone was assigned to this category. Large birds are considered here to be in the size range of hawks, eagles, geese, etc. This particular specimen exhibits several cut marks along the diaphysis.

Unidentifiable Mammal: Much of the bone from 5EA799 was assigned to this category. In this category, anything from a canid to a bison may be represented and virtually all of these bones are small diaphysis fragments likely the result of marrow and grease production.

Deer/Sheep/Pronghorn (D/S/P): In this category, the size of the animal could be determined but a specific identification could not be made. Many of the bones assigned to this category are long bone diaphysis fragments which lack articular ends or distinguishing features. Since no sheep or pronghorn elements were in the identified sample, these elements probably represent deer bones.

Elk-Bison: As with the above category, bones assigned to this category represent either elk or bison elements. Again, the overall fragmentary nature of the bone prevents further identification.

Sheep-Bison: This category is limited to a single bone recovered from Feature 14. This is a fetal bone, too fragmentary for precise identification, however a newborn mountain sheep or a fetal bison is represented.

A bone was considered identifiable if it possessed a distinguishing mark such as a muscle attachment, fossa, or if it had an articular surface. Much of the large mammal bone lacked complete articular surfaces but numerous small to medium-sized mammal bone possessed complete articular surfaces.

As mentioned above, faunal material was recovered from eight separate archaeological components. Two of these are considered to be either unknown or disturbed components and contain a very small quantity of faunal material. Since these components are separable based upon stratigraphy and/or radiometric dates, the faunal material from each of these components was treated as separate faunas. This approach has been termed the "maximum distinction method" (Grayson 1973:433). Using this approach provides a more realistic picture of prehistoric faunal utilization through time although the sample size differences do limit the overall interpretative value of the collection when discussing temporal changes in faunal utilization.

Two basic, interdependent quantification methods were used in this analysis. NISP refers to the number of identified specimens per taxa or category. With the identifiable bone, MNI or minimum numbers of individuals were calculated by counting the most common element of the same side per taxon. Age differences were taken into account when possible to arrive at more realistic MNI estimates.

Account of Species

Excavations at Yarmony produced a wide array of taxa. Thirteen mammalian genera are represented; one avian species, one fish genera, and one fish family are present in the collection. Most of the taxa identified from the Yarmony site are considered to be potential food species although direct data to support this claim is lacking for several of the smaller mammals identified.

CLASS Osteichthyes
Infraclass Teleostei
Family Catostomidae
Genus *Catostomus* or **Subgenus** *Pantosteus*

Fish bones from the Yarmony site were identified by Dr. W. L. Minckley of Arizona State University. All of the recovered bone are sucker elements, undoubtedly from fish recovered from the Colorado River. Unfortunately, precise identifications could not be made, however, two cranial elements from House 1 are referable to the group of mountain suckers of the subgenus *Pantosteus*. The other fish elements from House 1 are identifiable only to the sucker family Catostomidae.

Mountain suckers are common in the Colorado River system. They thrive in cooler headwater areas and they scrape, not suck, algae, diatoms, and organic material from the surface of rocks.

Generally, mountain suckers are small fish around 10 inches in length, but the bluehead sucker, common in the Colorado River, can grow to over 16 inches in length (Everhart 1974).

CLASS Aves
Order Galliformes
Family Tetraonidae
Genus and Species *Dendragapus obscurus* (Blue Grouse)

The Blue Grouse was the first bird recorded in Colorado. The Spanish friars Dominguez and Escalante noted the Blue Grouse in central Montrose County in 1776 (Marsh 1931; Bailey and Niedrach 1965). In Colorado, this grouse was formerly a common mountain resident at elevations between 7000 and 10,000 ft. Blue Grouse, when threatened, often take refuge in trees or fly away for only short distances. Blue Grouse are not known to be especially wary birds and it is often rather easy to bag these birds with stones or even clubs. Only two grouse bones, representing one individual, were recovered from the Early Archaic levels in House 1.

CLASS Mammalia
Order Lagomorpha
Family Leporidae
Genus and Species *Sylvilagus* sp. (*S. nuttallii*, or *S. audubonii*) *Lepus americanus* (Snowshoe Hare) and *Lepus townsendi* (White-tailed Jackrabbit)

Following Armstrong (1972), Nuttall's cottontail (*S. nuttallii*) is probably the cottontail represented at Yarmony. This species, also known as the Mountain

cottontail (Burt and Grossenheider 1976), lives at elevations between 6000 and 11,500 ft and occupy most of western Colorado's mountains and valleys. The Desert cottontail (*S. audubonii*) has a more restricted range in Colorado, primarily residing below 7000 ft. Modern distribution maps do not show the Desert cottontail currently residing in the area around the Yarmony site, however with the elevation falling within their range, all of the cottontail remains from the site were classified to the genus level only. Biometric techniques designed to separate the species have had limited success and are useful only on the complete mandibles, which we lack for the site (see Neusius and Flint 1985).

Two hare species are represented at Yarmony. The snowshoe hare (*L. americanus*) is a boreal mammal and in Colorado it resides in high mountain areas in coniferous forests (Armstrong 1972). Snowshoe hares are generally found between 8000 and 11,000 ft although they have been recorded at lower elevations during the winter months. All of the snowshoe remains were recovered from Early Archaic contexts with a total of six elements identified. Identifications of this species are based mainly upon the size of the element when compared to the smaller cottontail and larger white-tailed jackrabbit. Identified elements include two pelves, two distal humeri, a proximal ulna, and a metatarsal. All identifications of this species were based on adult individuals and if there was any uncertainty, the element was assigned to a general *Lepus* category.

Remains of the white-tailed jackrabbit (*L. townsendi*) are common at Yarmony. Bones of this species were identified from Late Prehistoric, Late Archaic, and Early Archaic contexts. This hare is common throughout Colorado, residing in the mountains and plains areas. It can live from 5000 ft to well above timberline (Armstrong 1972).

Rabbits and hares were an important feature of the meat diet at Yarmony during all cultural periods. During the winter months, these animals likely provided a very important food source and there is evidence from Yarmony suggesting the bones of these animals were processed for marrow and bone grease along with the bones of larger game animals.

Order Rodentia
Family Sciuridae
Genus and Species *Marmota flaviventris* (Yellowbelly marmot), *Spermophilus lateralis* (Golden-mantled ground squirrel), *Spermophilus richardsonii* (Richardson's ground squirrel).

Marmots live in mountainous areas where there are areas of broken rock to provide shelter (Armstrong 1972). These animals hibernate in burrows usually made under rocks during the colder months, generally from October through March/April. The length of hibernation is dependent upon elevation (Lechleitner 1969). Only two marmot elements, a left mandible from House 2 (Early Archaic) and a pelvis from House 1 were recovered. As a food source, marmots provide a good source of meat and they can be easy to capture in snares and deadfalls.

Bones of *Spermophilus* are common at Yarmony. Ground squirrels are fossorial (burrowing) by nature and rodent runs were a common sight during the excavation of the site. There are two species represented in the collection. The golden-mantled squirrel (*S. lateralis*) has a wide range of residence in Colorado (Armstrong 1972) and this species was observed on the site. The other

ground squirrel identified from the site is the Richardson's ground squirrel (*S. richardsonii*). Bones of this species are also limited to the Early Archaic levels. This squirrel occupies the plains and grasslands and can be found above timberline (Armstrong 1972). The *S. richardsonii* remains from Yarmony may be from the subspecies *S. richardsonii elegans*, although precise identifications cannot be made with the present sample. Assignment to specific levels was based on dental configurations (Chomko 1980) and size determinations. The bones of *lateralis* are smaller than those of *richardsonii* but there is an overlap in the size of these rodents (Burt and Grossenheider 1976). Questionable ground squirrel elements were assigned to a general *Spermophilus* category.

There is no direct evidence suggesting the cultural use of ground squirrels or marmots from Yarmony. None of the bones attributed to Sciurid were burned, cut, or broken in a manner clearly indicating cultural utilization.

Family Geomyidae
Genus and Species *Thomomys talpoides* (Northern pocket gopher)

There are two species of pocket gopher residing in the state of Colorado. The Valley pocket gopher (*T. bottae*) occupies the warm valleys in the southern part of the state, while *T. talpoides* occupies a broad geographical and altitudinal range throughout the state (Armstrong 1972). The sympatry of the two species is unknown, however contiguous allopatry or parapatry is always maintained (Armstrong 1972:149). With the sample of *Thomomys* from Yarmony, all are considered to be *T. talpoides* based upon current distributions and ecological settings. Most of the *Thomomys* remains from Yarmony are mandibles and there is no direct evidence suggesting the use of these animals as a food source.

Family Cricetidae
Genus and Species *Neotoma cinerea* (Bushy-tailed woodrat), *Peromyscus* sp. (White-footed mice), *Microtus* sp. (vole).

A total of 16 woodrat elements, mainly mandibles, were recovered from the Early Archaic and Late Archaic levels at Yarmony. Virtually all of these elements were recovered from the pit house fill of House 1. The bushy-tailed woodrat is a common resident of intermountain Colorado and its overall range extends from northern Arizona to the southern Yukon Territory (Armstrong 1972). Bushy-tailed woodrats occupy cracks, crevices, and "chimneys" as den sites, and they also occupy outbuildings and other "human" dwelling places (Armstrong 1972; Warren 1919). The distribution of woodrat remains at Yarmony is interesting in that their bones were found only in the fill of House 1. None were recovered from any of the other excavation units and none were recovered from the fill of House 2. It is suggested here that woodrats utilized the pit house structure as a nesting site after the house was abandoned. It is also possible that woodrats occupied the pit house at the same time it was occupied by the Indians. Although there is considerable ethnographic and archaeological evidence for the use of woodrats as a food source by native Americans (see Walker 1975), there is no direct evidence from the Yarmony site they were used as food.

Only one *Peromyscus* sp. element, a mandible, was recovered from Yarmony. Although there are several species in this genera in Colorado, the Deer mouse (*P. maniculatus*) is ubiquitous across the state. In the immediate area of the Yarmony site, it is possible for the Pinon mouse (*P. truei*) and the Brush mouse

(*P. boylii*) to be found. No further identification was possible on the archaeological specimen from Yarmony. Three other mouse spp. elements were recovered from the excavations, but no further identification could be made due to the fragmentary nature of the specimens. It is unknown if mice were utilized as a food source at Yarmony.

One vole element, a mandible lacking teeth, was recovered from House 1. Following Armstrong (1972), the meadow vole (*M. pennsylvanicus*), the mountain vole (*M. montanus*), and the long-tailed vole (*M. longicaudus*) could be found in the site vicinity. No further identification was possible and it is unknown if this small rodent was used as a food source.

Family Erethizontidae
Genus and Species *Erethizon dorsatum* (Porcupine)

Porcupines are the sole boreal representative of a Neotropical family (Armstrong 1972). The porcupine is widespread in Colorado ranging throughout the western portion of the state and on to the plains. Only one porcupine element, a maxilla fragment, was recovered from Yarmony and this was from the Early Archaic levels of House 1. Porcupines do not vary their habitat on a seasonal basis; they do not hibernate and they may live in colonies during the winter months (Lechleitner 1969; Burt and Grossenheider 1976). Porcupines are rather easy to kill whether on the ground or in trees, thus they would be rather easy prey. Porcupine quills as well as meat may have been sought by the occupants at Yarmony.

Order Carnivora
Family Canidae
Genus and Species *Canis familiaris* (Domestic dog), *Canis* sp. (Dog/Coyote)

Four elements from the Early Archaic levels in House 1 are considered to be from a domesticated dog. These elements include a near complete right mandible, a left mandible fragment, a complete calcaneum, and a butchered and burned proximal radius. The basis for the identification of these elements as domestic dogs includes the size of the elements, and the compressed and curved nature of the tooth row in the mandibles. These dog remains are discussed in greater detail in a later section of this chapter, but it is important to stress here that dogs and perhaps other canids were utilized as a food source at Yarmony. Eleven elements were assigned to a general *Canis* sp. category and one of these displays cut marks and evidence of burning. Canid bones were also used in the manufacture of jewelry.

Order Artiodactyla
Family Cervidae
Genus and Species *Odocoileus hemionus* (Mule deer) *Cervus canadensis* (Elk)

Mule deer are common throughout western Colorado and these animals were an important food source to the aboriginal occupants of the state. At Yarmony, mule deer were identified from the Early Archaic components of House 1, House 2 and from Feature 14. Although the actual number of deer bones identified from the sample is small, only 16, this is a reflection of the cultural practice of processing the bone for marrow and grease. Many bone fragments which could not be identified were assigned to a deer/sheep/pronghorn size category (Lyman 1979).

Identified bones of the elk are also rather rare at Yarmony. Only 15 bones were identified as elk and most of these came from House 1. As with the deer bone, elk bones were intensively processed for marrow and grease production at Yarmony. A later section of this chapter will discuss this practice as it pertains to the Yarmony sample. It should be noted that the immediate area around the Yarmony site is considered to be prime winter range for modern herds of deer and elk.

Family Bovidae
Genus and Species *Bison bison* (Bison), *Ovis canadensis* (Mountain Sheep)

Two bison elements were identified from Yarmony. The first of these, a calcaneum fragment, was excavated from the East Road Cut dating at 7000 BP. The second element is a third phalange excavated from House 2 and is considered to be of Early Archaic age.

In prehistoric times, bison ranged over much of Colorado. In the mountains, their range included mountain parks and valleys and at times ranged above timberline (Warren 1927; Biedleman 1955). It is generally thought there were two subspecies of bison living in Colorado. These were the plains bison (*B. bison bison*) and the mountain bison (*B. b. athabascae*). However, the genetic distinctions between these two kinds are arguable (Armstrong 1972).

The bison remains from the East Road Cut are highly fragmented and appear to be more weathered than other bone on the site. In addition to the bison calcaneum, there were several unidentifiable large mammal bone fragments which very well could be from bison. The phalange from House 2 is in good condition, showing no weathering or modification. It is possible that some of the bone assigned to the elk/bison size category and to the unidentifiable large mammal bone category are from bison. With the present evidence, the role of bison in the diet at Yarmony remains uncertain.

Numerous tooth and tooth enamel fragments were recovered at Yarmony. Since many of these were small fragments, they were assigned to a general Artiodactyla category. None of the enamel fragments were complete enough for further identification.

There is some question as whether mountain sheep are present in the Yarmony sample. Certainly some of the bone fragments assigned to the D/S/P category could be from sheep, however, no clearly diagnostic sheep bones were identified. One small bone fragment from a fetal individual was noted from Feature 14. This bone is clearly from a fetal individual but due to its fragmentary nature, a precise identification could not be made. Dr. Danny Walker of the University of Wyoming examined the bone and concluded it was from a newborn mountain sheep or a fetal bison.

Discussion of Faunal Remains by Component

All eight of the defined archaeological components produced faunal material. There is a disparity in the amount of faunal material recovered from each of these components (Table 8.1) making it difficult to analyze temporal changes in faunal utilization at 5EA799.

Table 8.1

Breakdown of Faunal Material by Component from 5EA799

Component	Total # Bones	% of Total Sample
Disturbed (DIST)	12	.5%
Unknown (UNK)	7	.3%
Late Prehistoric (LP)	66	2.8%
Late Archaic (LA)	144	6.2%
Early Archaic House 1 (EAH1)	1877	80.1%
Early Archaic House 2 (EAH2)	136	5.8%
Early Archaic East Road Cut (EARC)	55	2.4%
Early Archaic Feature 14 (EAF14)	45	1.9%
Total	2342	100.0%

Disturbed and Unknown Components

Most of the bone in these components was derived from the upper levels of House 2 within a zone of cultural mixing, or from scattered test pits where specific component assignments could not be made. Only 19 bones are involved here with very limited interpretative value. One artiodactyla tooth enamel fragment, one *Thomomys talpoides* mandible, one *Spermophilus* sp. element, 12 unidentifiable large mammal bone fragments, three unidentifiable mammal bone fragments, and one unidentifiable medium mammal bone fragment were assigned to these components.

Late Prehistoric

The Late Prehistoric component at 5EA799 is within 20 cm of the modern ground surface. Bone from this component is generally more weathered with longitudinal cracks evident on most pieces. The sample of faunal material is small, with only 66 bones assigned to this component. Table 8.2 presents a breakdown of the faunal material assigned to the Late Prehistoric component.

With such a small sample of bone, it is difficult to make conclusive statements about Late Prehistoric faunal utilization. It would appear that medium-sized mammals (rabbits and hares) and artiodactyls were the main components of the meat diet. Artiodactyls are represented by tooth enamel fragments and the fragmented bone assigned to the deer/sheep/pronghorn and unidentifiable large mammal categories. Bone grease and marrow extraction was a common practice based upon the presence of the highly fragmented and burned pieces of bone. Roughly 30% of the Late Prehistoric sample is burned, but none of the identifiable pieces are burned.

A minimum of two jackrabbits is represented based upon the recovery of two left distal tibiae. Cottontail is represented by a small cranium fragment while the pocket gopher is represented by a single right mandible fragment.

Table 8.2

Faunal Material from the Late Prehistoric Component 5EA799

Category	NISP	MNI	% Total	% Identifiable	% Categorized
Lepus townsendi	5	2	7.6	50.0	-
Artiodactyla	3	-	4.5	30.0	-
Sylvilagus sp.	1	1	1.5	10.0	-
Thomomys talpoides	1	1	1.5	10.0	-
Subtotal	10	4	15.1	100.0	-
D/S/P	2	-	3.0	-	3.6
Elk/Bison	1	-	1.5	-	1.8
unid.lg.mammal	11	-	16.8	-	19.6
unid.med.mammal	4	-	6.1	-	7.1
unid.mammal	37	-	56.0	-	66.1
unid.	1	-	1.5	-	1.8
Total	66		100.0		100.0

Late Archaic

The Late Archaic component produced 144 bones and bone fragments. Although the collection is small, a wide array of mammalian species is represented. Table 8.3 presents a breakdown of the Late Archaic fauna from 5EA799.

Since most of the bone assigned to this component is highly fragmented and burned (36%), bone marrow extraction and grease production were important activities carried out on the site during the Late Archaic occupation. The only burned identifiable element is an elk calcaneum fragment. Most of the unidentifiable large mammal bone fragments are small long bone diaphysis pieces, many of which exhibit spiral fractures and, as mentioned, a substantial number are burned. The Late Archaic fauna compares well with other Late Archaic faunal collections in western Colorado (Wilson 1981; Gooding and Shields 1985).

Early Archaic

Excavations at 5EA799 produced faunal material from four separate Early Archaic components. Most of the bone was recovered from House 1 but a sizeable quantity of material was recovered from House 2 (partially excavated), Feature 14, and the East Road Cut. The latter component is the earliest dated component at the Yarmony site dating at ca. 7000 BP.

House 1. More than 80% of the bone sample from Yarmony originated from the excavation of this house. A total of 1877 bones was recovered from the Early Archaic levels of House 1. It should be noted that much of the bone recovered from the excavation of House 1 represents refuse from the later occupation of House 2. Table 8.4 presents a breakdown of the species and categories represented.

Table 8.3

Faunal Material from the Late Archaic Component 5EA799

Category	NISP	MNI	% Total	% Identifiable	% Category
Odocoileus hemionus	1	1	.7	10.0	-
Artiodactyla	1	-	.7	10.0	-
Cervus canadensis	1	1	.7	10.0	-
Marmota flaviventris	1	1	.7	10.0	-
Lepus townsendi	3	1	2.1	30.0	-
Neotoma cineara	1	1	.7	10.0	-
Spermophilus sp.	1	1	.7	10.0	-
Thomomys talpoides	1	1	.7	10.0	-
Subtotal	10		7.0	100.0	
deer/sheep/pronghorn	2	-	1.4	-	1.5
elk/bison	1	-	.7	-	.8
unid.	1	-	.7	-	.8
unid.mammal	82	-	56.9	-	61.1
unid.lg.mammal	35	-	24.3	-	26.1
unid.med.mammal	13	-	9.0	-	9.7
Total	144		100.0		100.0

Faunal remains from House 1 illustrate the overall degree of bone processing which took place at the Yarmony site. Most of the bone from the House 1 excavation consists of small fragments of bone assigned to a general unidentifiable mammal category. Intensive processing of bone for marrow, grease and soup has resulted in a faunal collection suggestive of a dietary stress situation, such as a winter occupation. Medium-sized mammal bone also exhibits a high degree of fracturing indicating the bones of rabbits, hares, canids, and possibly medium-sized rodents were also processed in much the same manner as the bones of larger artiodactyls.

A look into the identifiable sample from the Early Archaic components at the site indicates that jackrabbits, cottontails, elk, deer, and bison to some extent, were the primary food animals during this time period. Dogs, Blue Grouse, porcupines, suckers and possibly ground squirrels, woodrats, and pocket gophers added to the meat diet.

There is no conclusive evidence suggesting the use of woodrats, ground squirrels, pocket gophers or any other smaller rodents as food. None of their elements were burned or cut and the overall distribution of skeletal elements of woodrats and pocket gophers is especially interesting. Of the 37 total elements identified as either woodrat or pocket gopher, 23 or 62.2% are mandibles. Post cranial materials are under-represented for some reason. The remains of *Spermophilus* are more evenly distributed than those of the pocket gopher. Most long bones are represented as are several vertebra, mandibles and cranium fragments.

Table 8.4

Faunal Material from House 1, Early Archaic

Category	NISP	MNI	% Total	% Identifiable	% Categorized
Odocoileus hemionus	14	1	.7	6.6	-
Cervus canadensis	12	1	.6	5.7	-
Artiodactyla	9	-	.5	4.3	-
Lepus townsendi	37	3	2.0	17.6	-
Lepus americanus	3	2	.2	1.4	-
Lepus sp.	7	1	.4	3.3	-
Sylvilagus sp.	17	3	.9	8.1	-
Canis familiaris	4	1	.2	1.9	-
Canis sp.	11	1	.6	5.2	-
Thomomys talpoides	22	7	1.2	10.4	-
Neotoma cinerea	15	5	.8	7.1	-
Microtus sp.	1	1	.05	.5	-
Peromyscus sp.	1	1	.05	.5	-
Mouse spp.	4	1	.2	1.9	-
Spermophilus lateralis	23	2	1.2	10.9	-
Spermophilus richardsonii	7	2	.4	3.3	-
Spermophilus sp.	11	3	.6	5.2	-
Erethizon dorsatum	1	1	.05	.5	-
Dendragapus obscurus	2	1	.1	.9	-
Catostomidae	8	??	.4	3.8	-
cf. *Pantosteus*	2	1	.1	.9	-
Subtotal	211		11.25	100.0	-
D/S/P	24	-	1.3	-	1.4
Elk/Bison	28	-	1.5	-	1.7
unid. small mammal	49	-	2.6		2.9
unid. med. mammal	222	-	11.8	-	13.3
unid. mammal	901	-	48.0	-	54.1
unid. lg. mammal	389	-	20.7	-	23.4
unid. lg. bird	1	-	.05	-	.06
unidentifiable	52	-	2.8	-	3.1
Total	1877		100.0	100.0	99.96

House 2. House 2 was partially excavated during the summer of 1988. The limited excavations in this house produced 136 bones, with nearly 15% being identifiable. Faunal material from House 2 is presented in Table 8.5.

The House 2 fauna lacks cottontail bones which were identified in the House 1 fauna. The lack of cottontail in House 2 is considered to be a function of sample size rather than cultural preference or environmental change.

Feature 14. Excavations in Feature 14 produced 45 bones and most of these were not identifiable. Deer and snowshoe hare were the only species identified

Table 8.5

Faunal Material from House 2, Early Archaic

Category	NISP	MNI	%Total	%Identifiable	%Categorized
Bison bison	1	1	.7	5.0	-
Cervus canadensis	2	1	1.5	10.0	-
Odocoileus hemionus	3	1	2.3	15.0	-
Artiodactyla	3	-	2.3	15.0	-
Lepus americanus	2	1	1.5	10.0	-
Lepus sp.	1	1	.7	5.0	-
Canis sp.	1	1	.7	5.0	-
Marmota flaviventris	1	1	.7	5.0	-
Spermophilus richardsonii	1	1	.7	5.0	-
Spermophilus sp.	2	1	1.5	10.0	-
Thomomys talpoides	2	1	1.5	10.0	-
Mouse spp.	1	1	.7	5.0	-
Subtotal	20		14.8	100.0	-
D/S/P	7	-	5.1	-	6.0
Elk/Bison	1	-	.7	-	.9
unid.med. mammal	12	-	8.8	-	10.3
unid. mammal	36	-	26.5	-	31.1
unid.lg. mammal	60	-	44.1	-	51.7
Total	136		100.0		100.0

from the sample, and most of the recovered bone consists of large mammal bone fragments. The archaeofauna from Feature 14 is presented in Table 8.6.

The bone from the Feature 14 excavation likely represents some type of outside processing area where bone was fractured and cooked, or a midden. The percentage of burned bone recovered from the feature is high (77.7%) compared with a much lower overall percentage of burned bone from the site. The only other area of the site with a high percentage of burned bone is the East Road Cut collection discussed below.

One bone from the Feature 14 midden presented a problem for identification. The element is from a fetal individual but identification proved difficult due to the fragmentary and burned nature of the bone. The element was sent to Dr. Danny Walker of the University of Wyoming and he determined the element to be within the size range of a seven month fetal bison or a newborn mountain sheep. If it is from a bison, that would suggest a February to March occupation for the site. If it is from a sheep, a May occupation is suggested (Walker, personal communication). Although the data is inconclusive, a winter/spring occupation is indicated even though an exact identification could not be made. Walker was certain, based upon the diameter of the bone, that it did not represent deer, elk, or antelope.

Table 8.6

Faunal Material from Feature 14, Early Archaic

Category	NISP	MNI	%Total	%Identifiable	%Categorized
Odocoileus hemionus	1	1	2.2	50.0	-
Lepus americanus	1	1	2.2	50.0	-
Subtotal	2		4.4	100.0	-
D/S/P	6	-	13.3	-	14.0
sheep/bison**	1	-	2.2	-	2.3
unid.lg. mammal	16	-	35.6	-	37.2
unid.med. mammal	3	-	6.7	-	7.0
unid. mammal	16	-	35.6	-	37.2
unid.small mammal	1	-	2.2	-	2.3
Total	45		100.0		100.0

** See text

East Road Cut. A total of 55 bone fragments were recovered from the East Road Cut (Table 8.7). This is the earliest dated component identified at the Yarmony site. Most of the bone from this component is highly fragmented and burned large mammal bone. Bison and jackrabbit are the only species identified from this component, however it is highly likely much of the fragmented large mammal bone, as well as the four elk/bison size elements are bison. A very high percentage of the bone from this component is burned and it is interpreted as representing a specialized faunal processing area.

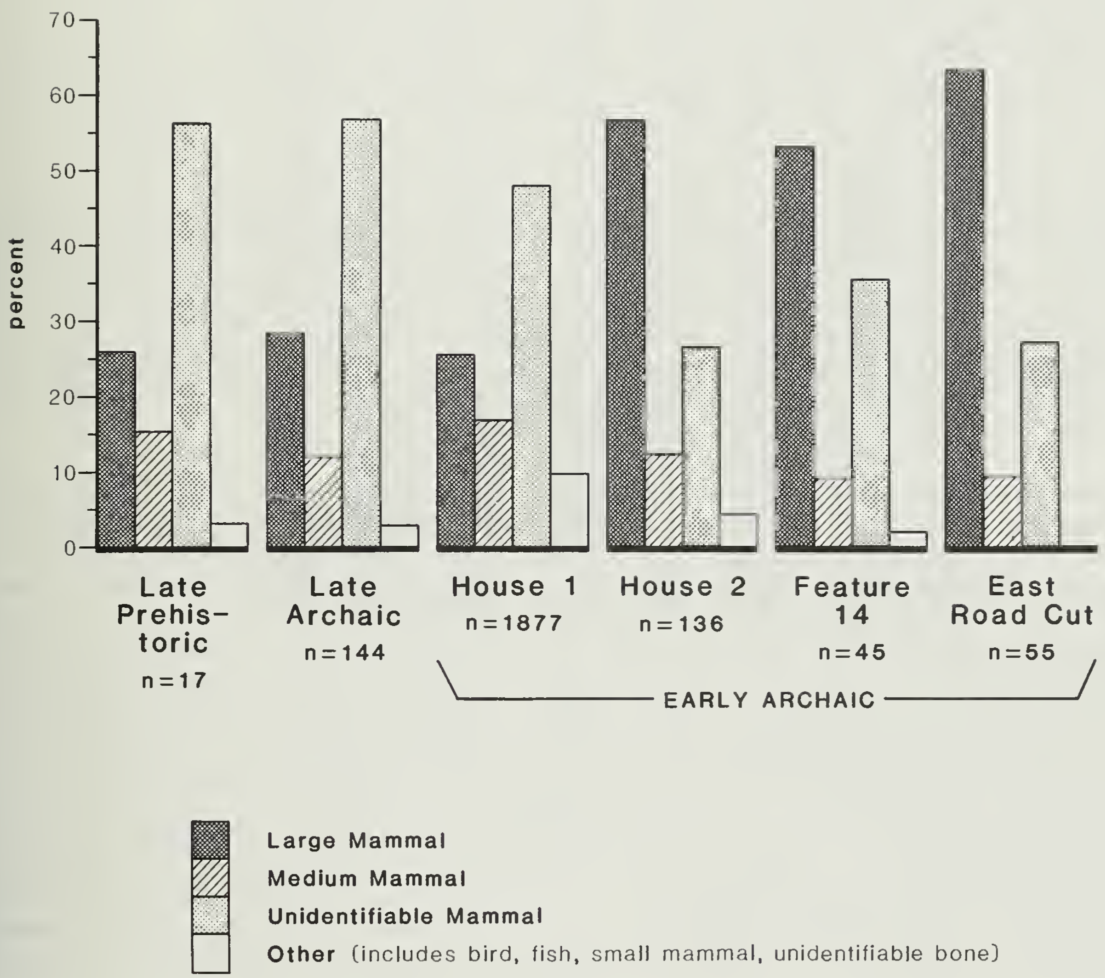
As mentioned above, a high percentage of the bone recovered from the East Road Cut (60.0%) is burned. Again, this portion of the site likely represents some type of specialized activity area where the processing of faunal material was accomplished.

Discussion

The faunal remains from the Yarmony site provides us with a rare look into prehistoric animal utilization in the Colorado mountains. Bone is not usually well preserved in mountain sites so the presence of such a large and diverse sample of faunal material is encouraging for future research. Several aspects of the sample are discussed in the following pages offering suggestions concerning faunal utilization at the site, subsistence, cultural modification of bone, and seasonality.

Subsistence

Several changes and consistencies in faunal utilization can be seen in the sample from Yarmony (Figure 8.1). Due to the great differences in the sample size between components, caution should be exercised, however it is clear that deer, elk, perhaps some bison (large mammals), and rabbits, hares (medium



PERCENTAGES OF MAMMAL BONE BY COMPONENT

FIGURE 8.1

Table 8.7

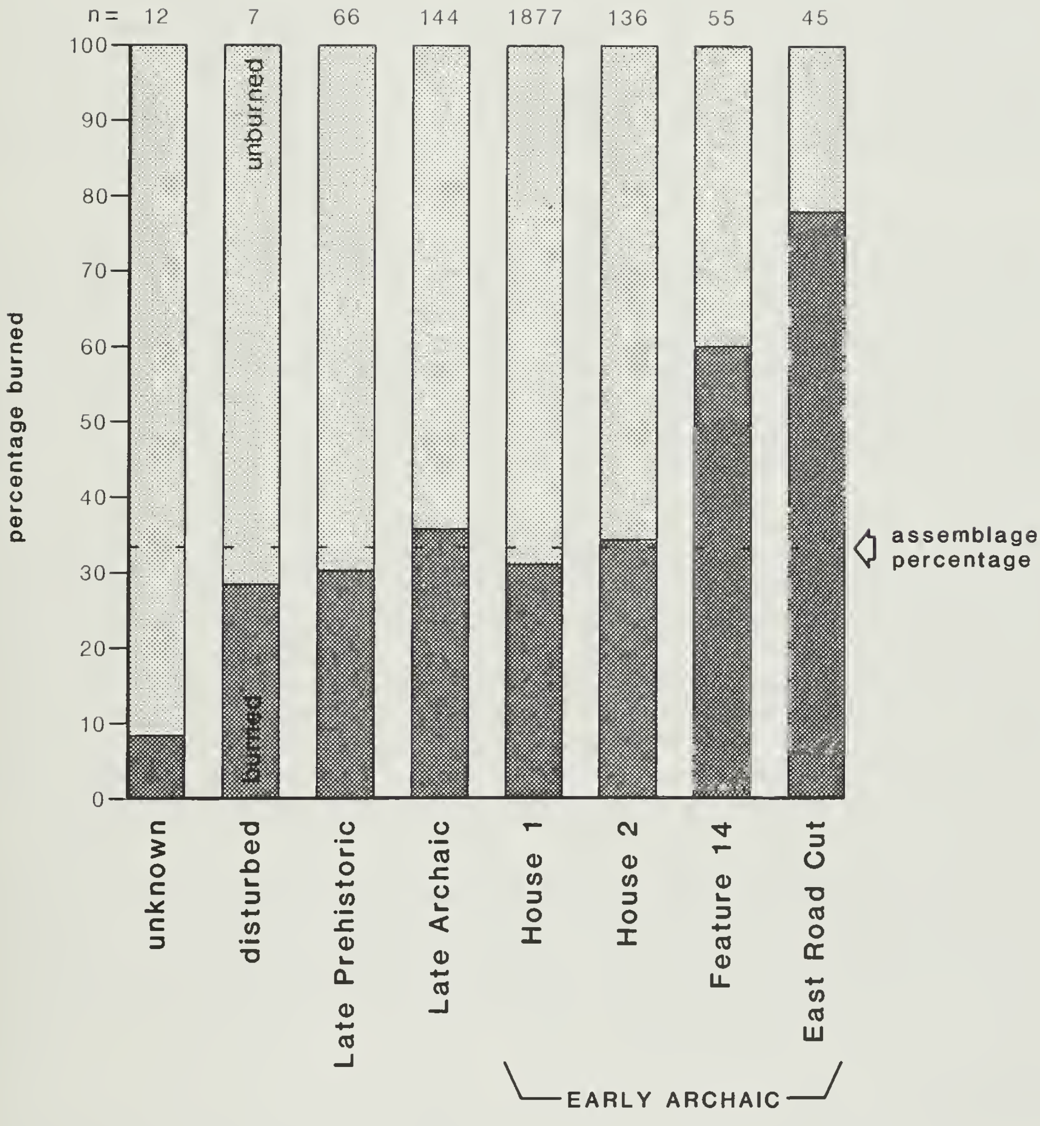
Faunal Material from the East Road Cut, Early Archaic

Category	NISP	MNI	%Total	%Identifiable	%Categorized
Bison bison	1	1	1.8	50.0	-
Lepus townsendi	1	1	1.8	50.0	-
Subtotal	2		3.6	100.0	-
Elk/Bison	4	-	7.3	-	7.5
unid.lg. mammal	30	-	54.5	-	56.6
unid.med. mammal	4	-	7.3	-	7.5
unid. mammal	15	-	27.3	-	28.3
Total	55		100.0		99.9

mammals) were important food species during all time periods at the site. Medium mammals are a consistent feature in the faunal makeup throughout all time periods on the site. Rabbits and hares are readily available and these are animals which are easy to catch in snares and deadfalls. Another consistent feature is the contribution small mammals, fish and birds made to the diet. Only the East Road Cut lacks this category and that is not totally surprising since this is a specialized faunal processing area not associated with the pit house component on the site.

One change observed in the sample is the overall percentage of large mammal bone by component. The percentages of large mammal bone shown in Figure 8.1 include both identified species (deer, elk, bison) and categorized bone (d/s/p, elk/bison, unidentifiable large mammal). There is a higher percentage of large mammal bone from House 2, Feature 14, and the East Road Cut when compared to the other three components on the site. Part of this difference is easily attributed to the functional aspect of two of the components. Feature 14 and the East Road Cut represent activity areas where animal processing was being accomplished. In both cases, large mammals (bison, elk, deer) were the focus and the activities associated with these areas included initial processing marrow extraction and perhaps grease production. A high percentage of the bone from each of these components was burned (Figure 8.2). It is important to realize both Feature 14 and the East Road cut represent discrete activity areas which display a different faunal makeup from the rest of the site. Material from the Late Prehistoric and Late Archaic components represent a more scattered, diffuse array of faunal material not necessarily associated with any discrete occupation or activity area.

Bone from the pit house fill of both House 1 and House 2 represents yet another discrete makeup of materials, that being midden deposit. Faunal material in House 1 is refuse from a later Early Archaic occupation. The material recovered from House 2 is also midden deposit. Both faunas are Early Archaic in age and are clearly associated with the pit house occupations on the site. Figure 8.1 suggests a difference in large mammal utilization between House 1 and House 2. This in fact may be true, however, due to the difference in the sample



BURNED BONE PERCENTAGE BY COMPONENT

FIGURE 8.2

sizes from the two components, and the fact that only a small portion of House 2 was excavated, this observation remains untested and questionable.

Although both the NISP and MNI counts are low for deer and elk, these animals were probably major sources of food for the 5EA799 occupants. The site is within artiodactyla winter range and it is unlikely the Yarmony occupants had to travel far to encounter one of these animals. The major reason for the low NISP and MNI counts has to do with the cultural modification of the bone for marrow and grease production. There was not a single complete articular end in the collection and all of the identified deer and elk phalanges were cracked for marrow extraction. The degree of faunal processing, in terms of bone breakage, can be an indicator of stressful situations. This subject will be dealt with in greater detail in the Seasonality section of this chapter.

The role of bison in the prehistoric diet at Yarmony is unclear. Only two bison elements, a calcaneum fragment from the East Road Cut and a 3rd phalanx from House 2, were recovered from the site. It is possible there are other bison elements present in the collection and only identified to the large mammal or elk/bison size categories. If the distal humerus discussed in the seasonality section is indeed from a fetal bison, the implication is for a winter (February-March) occupation of the site (Walker, personal communication). However, the identification is uncertain due to the fragmentary nature of the particular bone.

Other mammals which were important sources of food include grouse, and the domesticated dog further discussed below. Porcupines, marmots, and possibly other small rodents were additions to the diet. There is not conclusive evidence at Yarmony that ground squirrels, pocket gophers, or woodrats were used as food.

Fish were recovered only from waterscreen samples taken from House 1. All elements are from suckers (Catostomidae), however mountain suckers of the subgenus *Pantosteus* may be represented. Fish elements were recovered from waterscreened samples taken from near the floor of the house. This clearly indicates their utilization as food by the Early Archaic occupants of House 1.

It is obvious from the collection of faunal material from 5EA799 that the complete processing of bone for marrow and grease was an important activity at the site during all time periods. The sample of identifiable bone is small, but it indicates a wide range of species utilization and it indicates that the bones of both large and small game was processed in much the same manner to extract the marrow and grease.

Burned Bone

Just over 33% of the entire sample of bone from 5EA799 was burned. However, two components have much higher percentages of burned bone. Nearly 80% of the bone from Feature 14 is burned and 60% of the bone from the East Road Cut is burned (Figure 8.2). These two areas are not within house features and likely represent outside activity areas where bone was processed for marrow and grease.

Butchered Bone

Cut marks are rare on bone from Yarmony. This is due to the overall fragmentary nature of the bone masking the locations of cut marks. A number of

bone fragments from House 1 do show cut marks but little can be said concerning aboriginal butchering techniques. Not considering those bones which show groove-and-snap cuts made during bead manufacture, only nine fragments exhibit cut marks. One jackrabbit ulna shows several horizontal cut marks near the proximal end suggesting disarticulation. Another jackrabbit femur exhibits horizontal cut marks across the proximal anterior diaphysis also suggesting disarticulation. Two elk/bison rib fragments show numerous cuts along the interior facet of the rib. In one case, the cuts are horizontal along the ventral surface of the rib, near the proximal end. In the second case, the cuts are along the long axis of the rib, also on the ventral side. The location of these cuts suggests the stripping of tissue from the ribs or filleting (Binford 1981:137). One deer accessory carpal exhibits several cuts along the exterior face possibly representing skinning marks.

Spiral fractured bone is common from Yarmony. Virtually all of the large mammal bone from the site exhibit "green breaks" produced during the processing of bone for marrow and grease. No complete articular ends were recovered from the site and the degree of bone breakage is suggestive of maximal faunal processing. An important aspect of the Yarmony collection is the presence of single impact points on large mammal long bone fragments and the absence of tooth marks or furrows which are expected on heavily carnivore damaged bone assemblages.

Bone grease is produced by pounding the bone to increase its surface area then boiling the fragments to render the grease (fat) (see Leechman 1951). The grease is then used as food and as a food additive or eaten alone (Leechman 1951; Vehik 1977). Generally, the bones which contain the most cancellous tissue, the femur, humerus, proximal tibia, are the primary elements processed for grease. At Yarmony, virtually all of the bone including phalanges and mandibles was processed in this manner.

Elements Represented

The distribution of large mammal bone (deer, elk, bison) at Yarmony reflects which elements were returned to the site and processed. There is a fairly even distribution of bone by skeletal portion from the site as a whole. Cranial portions, which for the most part consist of fragmentary teeth, are most abundant, followed by long bone diaphysis fragments, fore and hind limbs, and metapodials. Portions of the axial skeleton, namely vertebra and ribs, are under-represented in comparison with the other skeletal portions identified. The low representation of vertebra and ribs can be explained with several alternatives. It is possible that vertebra were discarded at kill locations and simply not returned to the site area. At kill locales, certain cranial elements, including mandibles along with front and rear quarters, were disarticulated and packed to the site. Another possibility is that, as with other bone, vertebra were processed for grease beyond recognition. If this were the case, it is my opinion that more vertebra fragments would have been recovered. The large mammal rib fragments that were recovered exhibit intensive butchering evidence indicating every available shred of tissue was stripped from these elements.

Another factor which may account for the low representation of vertebra and ribs is these elements may have been returned to the site, yet discarded in a portion of the site yet unexcavated. The Feature 14 area, not directly

associated with a pit house, did not produce any large mammal bone elements inconsistent with what was recovered elsewhere on the site.

Domestic Dog

Two mandibles are considered to be from domesticated dogs (*Canis familiaris*). The elements referred to as Canis sp. from 5EA799 are probably also from dogs. Dogs arrived in the New World with man some time prior to 10,000 BP (Olsen and Olsen 1977; Lawrence 1967, 1968) and the earliest domesticated dog may have been derived from the small Asian wolf (Olsen 1974, 1985; Olsen and Olsen 1977). The earliest record of domesticated dog in North America is from the Agate Basin site in Wyoming. This find, from the Folsom occupation of the site dates around 10,500 BP (Walker and Frison 1982). Statistical analyses of canid material from North America illustrates the variability in size and morphology of both the wild and domestic canids (Allen 1920; Haag 1948; Walker and Frison 1982; Morey 1986; Bozell 1988). Although the sample of dog remains is small from Yarmony, measurements on the mandible fragments do provide some insight on the size range of the dogs from the site. Dog mandibles from Yarmony show a compressed mandibular tooth row, enlarged, well-worn molars, and there is an "S" curve to the tooth row.

All of the past and previous work on canid biostatistics has concentrated on cranial measurements. Crania are lacking from Yarmony so mandibular measurements on only two mandibles, both fragmentary, are the limit of our data. Bozell (1988) used 10 mandibular measurements in his analysis of Pawnee dog remains, however, he found only four consistently demonstrated size variation. The measurements used here are: tooth row length from the anterior canine/1 to the posterior molar/1; height of the mandible behind pre-molar/2; height of the mandible behind molar/1; and mandibular thickness at molar/1. The measurements from the two mandibles from Yarmony are presented in Table 8.8. Both of these mandibles are from House 1 and date to the Early Archaic occupation of the house.

Following the data published in Bozell (1988:101), the dog mandibles from Yarmony fit into either the cluster 3 or 4 size range. The cluster 3 size range consists of what Bozell terms "medium-sized dogs." One of his reference skeletons of a German Shorthair fell into this cluster. Cluster 4 dogs are within the size range of coyotes, or what Bozell terms small dogs (ibid:103). His cluster 1 and 2 size ranges are wolves, dog/wolf hybrids, and modern German

Table 8.8

Domestic Dog Mandibular Measurements, 5EA799
and Modern Coyote Mandible Measurements

FS #	Tooth Row C/1-M/1	Height of Mandible P/2	Height of Mandible M/1	Thickness of Mandible at M/1
998	72.2	18.4	23.5	10.0
1153	NA	NA	23.3	9.9
RR-42*	74.3	19.0	22.1	9.1

* Modern coyote (*Canis latrans*) from the author's comparative collection

shepherds. As indicated in Table 8.8, the size range of the dog mandibles from Yarmony is consistent with the modern coyote measurements.

Dogs were used as a food source at Yarmony. Several cut and burned Canis sp. bones were recovered and one of the mandibles was recovered from Feature 2 on the floor of House 1. The bones of canids were also used in bead manufacture as will be discussed in the bone tool section. Ethnographic accounts of dogs being used as a food source are numerous (see Snyder 1988), and the nutritional value of dog flesh is high with protein levels around 21% and fat levels of nearly 3% for 100 grams of muscle tissue (Snyder 1988). Additionally, dog meat has a caloric value of 274cal/100gm while bison has 138 calories for the same amount of raw meat. The nutritional value of dogs probably remained nearly the same throughout the year since dogs are good scavengers and are able to intake and digest a multitude of substances. Anything too spoiled for human consumption could be eaten and processed by dogs in and around any habitation site. Dogs were probably an important source of food during the winter and spring months at the Yarmony site or during any time when food stress became acute.

Ten small fragments of unidentifiable mammal bone exhibit deep longitudinal etching, tapered edges and small areas of light polish. These are not culturally modified, other than seven of the fragments are burned. These fragments probably represent bits of bone which have been passed through canid digestive tracts.

Seasonality

Faunal evidence suggesting a winter occupation of the Yarmony pit houses is scant. Overall, evidence suggesting a winter occupation is based upon several variables, none of which stand alone. These include the pit house itself, presence of internal storage features, maximal lithic utilization and maximal faunal processing. Another important factor is the location of the site within modern artiodactyl winter range.

Generally, a collection of fetal artiodactyl bone is needed to firmly establish a winter occupation. At Yarmony, only one fetal bone was recovered, and the identification of this fragment is tenuous. This particular bone, from the Feature 14 excavation block, is a distal humerus fragment of possibly a newborn mountain sheep (*Ovis canadensis*) or a seven-month fetal bison (*Bison bison*) (Walker, personal communication). An exact identification is not possible due to the fragmentary and burned nature of the bone. If a mountain sheep is represented by this bone, a May occupation is suggested. If the bone is from a bison, a February-March occupation is suggested (Walker, personal communication). Although this information is inconclusive, a late winter/spring occupation is indicated.

In addition to the fetal/neonate bone from Yarmony, there is one other line of evidence within the faunal data that suggests a winter occupation. This is the degree of processing of the bone itself. Virtually all of the large mammal bone from the site is fragmented into small pieces (1 to 3 cm). The general paucity of complete bones, even phalanges, is indicative of extensive bone processing for marrow, bone grease and soup (see Leechman 1951). Food insecurity can be measured by the degree of marrow extraction from bone elements which do not contain high quantities of marrow or calcaneus tissue which holds fat (Binford 1978). The degree to which prehistoric peoples processed skeletal

elements for marrow and grease is dependent upon several variables, especially seasonality and site function. With a site such as Yarmony (a residential base) and a collection of bone in which virtually all bone (including low utility marrow bones such as phalanges, metapodials and perhaps mandibles) is smashed practically beyond recognition, food stress and/or insecurity is indicated. Phalanges and mandibles do contain bone marrow, but extracting marrow from these elements is labor intensive; yet it would be productive in insecure situations for providing marrow and grease. Mandibles were processed to such a degree at Yarmony that only a few condyle fragments and teeth fragments were recovered. The complete processing of mandibles during times of food insecurity makes a great deal of nutritional sense. Baker and Lueth (1967) and Speth (1983) report the mandibular bone marrow in deer has a higher proportional fat content that the marrow of limb bones.

There are other archaeological sites in the Rocky Mountains with documented winter occupations which show a high degree of bone processing. The Bugas-Holding site in Wyoming has a clear winter occupation based upon a full range of fetal materials. The bone from this site shows extensive processing for marrow and grease which probably took place over a three- to four-month period during the winter (Todd and Rapson 1988). Evidence from the Dead Indian Creek site, also in Wyoming, indicates mule deer were killed throughout the winter months (Simpson 1984) and food insecurity is suggested from this site based upon the processing of mandibles, crania and phalanges (Fisher 1984).

At the Vail Pass site in Colorado (Gooding 1981), elk, bison and bighorn sheep are the dominant fauna. The elk bones are highly fragmented and Wilson (1981) comments that cracked phalanges were quite numerous in the faunal collection. Phalanges were cracked longitudinally and transversely at Vail Pass, a pattern also observed at Yarmony. Wilson (1981) further notes the lack of articular ends at Vail Pass and suggests the complete processing of these elements for marrow and grease. Two near full-term fetal elk elements were recovered at Vail Pass, suggesting a late spring/early summer occupation of that site. By spring, herds are expanding to calving areas and snow-free areas, with human hunters following the herds. Again, the degree of bone processing at Vail Pass is indicative of food insecurity.

Intensive processing of bone from sites thought to have winter occupations falls to reason. In times of unsure food and logistical problems in transporting game, maximal processing of body parts, including those of general low utility, takes precedence. Another important factor to be considered is the fragmented medium mammal bone (lagomorphs) from Yarmony. Bones from these mammals were also fragmented for marrow and likely processed right along with the larger mammal bone.

CHAPTER 9

BOTANICAL AND GASTROPOD STUDIES

Introduction

This chapter reports the results of flotation, pollen, gastropod, and wood sample identifications from the Yarmony Site. Each of these analyses is presented as a separate section of this chapter and each with its own authors. Field collections for all of these samples were made by the archaeological crew, and sent to the respective experts for analysis. Margaret Van Ness of Golden, Colorado floated samples and identified their content; Dr. Susan K. Short performed the pollen analyses. Dr. Shi-Kuei Wu of the University of Colorado identified the gastropods. Dr. Craig Shuler of the Wood Science Laboratory at Colorado State University identified the wood samples. The latter two consultants simply provided identifications of the samples submitted to them, the interpretations based on these analyses are the work of Metcalf and McKibbin.

Macrobotanical Analysis

by
Margaret A. Van Ness

Twenty-two flotation samples and nine botanical samples from archaeological site 5EA799 in central Colorado were processed and analyzed. The site is located in the Colorado River valley along Eagle County Road No. 11 in Eagle County. The cultural remains at the site include a shallow pit house depression with an adjacent smaller depression to the southeast (possible work area) and several associated artifacts and floor features. The structure dates to approximately 6300 BP. The purpose of this investigation is to recover and identify culturally significant macrobotanical remains to aid in the understanding of prehistoric plant use. Macrobotanical remains are defined as all non-charcoal, possibly identifiable vegetable parts which are visible through a 10x binocular scope.

The site is situated at approximately 7140 ft (2176 m). Local vegetation is dominated by mixed grasses and sagebrush (*Artemisia tridentata*), with scattered Rocky Mountain juniper (*Juniperus scopulorum*), and a few scattered prickly pears (*Opuntia*). Dense stands of Douglas-fir (*Pseudotsuga menziesii*) and piñon pine (*Pinus edulis*) grow on the upper slopes south of the site.

The flotation samples consist of soil from features and general contexts within the site, and the botanical samples are macrobotanical specimens observed during excavation (Table 9.1). Twenty-four of the samples are from the main pit house, with 13 from the floor, two from general fill, and nine from features. Six of the samples are from features within the work area, and one is from a hearth near the main pit house. Features 1 and 2 are adjacent slab-lined cists

Table 9.1

Sample Provenience
(*denotes botanical sample; otherwise sample is a flotation sample)

FS#	Horizontal	Vertical	F#	Comments
1089	south wall, E/W backhoe trench	78-82 cm below road grade at Unit 3-5 contact	14	basin shaped oxidized feature south of main pit house
1131	135N 101E	160-162cm BD-1	1	lower fill from slab lined cist on floor of main pit house
1134	135N 101E	162-165cm BD-1 (just above base scrape)	1	lowest fill from slab lined cist on floor of main pit house
1136	136N 101E	148-166cm BD-1	2	lowest fill from slab lined cist on floor of main pithouse
1137	135N 101E	165-170cm BD-1	1	scrape beneath base slab from slab lined cist
1197	135N 102E	110-118cm BD-1	4	lower fill of slab lined cist in work area/antechamber
1199	135N 102/103E	118-124cm BD-1	3	lower fill of slab lined cist in work area/antechamber
1245	136N 98E	77-87cm BN		floor fill near west edge of main pit house
1311	137N 99E SE 1/4	97-107cm BN	11	floor fill in and near Feature 11 of main pit house
1312	137N 99E	118-128cm BD-2		floor fill near Feature 11 in main pit house
1313	136N 99E	97-107cm BN		floor fill between Features 9 and 11 in main pit house
1314*	136N 100E	115-120cm BD-2		floor fill of main pit house
1315	137N 100E	140-145cm BD-1	10a	floor fill in and near Feature 10a of main pit house

Table 9.1 (continued)

FS#	Horizontal	Vertical	F#	Comments
1316	137N 101E	137-147cm BD-1	10a	floor fill in and near Feature 10a of main pit house
1317*	137N 98E	87-97cm BN		0-20cm N, 25-100cm E general fill of main pit house
1319*	137N 99E	118-128cm BD-2		0-100cm N, 0-100cm E general fill of main pit house
1320*	138N 101E	130-135cm BD-1		floor contact fill of main pit house
1321*	135N 99E	97-107cm BN		floor of main pit house
1322	138N 99E	87-97cm BN		floor fill from NW quadrant of main pit house
1323	138N 100E	135-140cm BD-1		floor fill near Feature 10a in northern part of main pit house
1324*	136N 99E	87-97cm BN		floor of main pit house
1326	135N 99E	87-97cm BN		floor fill near Feature 6 in SW part of main pit house
1460a	135N 99-100E	140-145cm BD-2	6	feature fill from depression near center of main pit house
1460b*	135N 99-100E	140-145cm BD-2	6	feature fill from depression near center of main pit house
1476	134N 103E	130-139cm BD-1	7b	feature fill from depression in work area/antechamber
1481*	134-135N 103E	125-130cm BD-1	8a	hearth fill in work area
1482	134-135N 103E	130-137cm BD-1	8a	lower hearth fill in work area

FS#	Horizontal	Vertical	F#	Comments
1484	136N 99E	161cm BD-2	9	feature fill from slab lined pit near center of main pit house
1485	134N 103E	137-143cm BD-1	7a	feature fill of depression in work area/antechamber
1530a*	136N 100E	153-158cm BD-1	5	fill of central hearth in main pit house
1530b	136N 100E	153-158cm BD-1	5	fill of central hearth in main pit house

within the main pit house, and Features 3 and 4 are similar features within the work area. Feature 5 is the central hearth in the main pit house, and Feature 8a is the central hearth in the work area. The other features consist of pits, depressions, or oxidized areas.

Processing and Identification

The 22 flotation samples were processed using a water flotation technique. This process is based on the principle that organic remains float on the surface when a soil sample is submerged and agitated in water. Flotation sample size ranged from .780 to 1.56 liters (Table 9.2). The sample is placed in a five-gallon bucket which is then filled with water and agitated. The floated remains (light fraction) are poured into a 0.5 mm screen. The bucket is then refilled with water and agitated, and the floated remains again poured onto the screen. This process was repeated, usually three to five times, until little or no debris floats. The light fraction is then air dried on newspaper-lined cardboard flats. The part of the sample which does not float is gently waterscreened in a 2.0 mm screen. All debris which does not pass through this screen (heavy fraction) is also air dried. Both the light and heavy fractions of each sample were examined under a binocular scope at 10x. All possible cultural remains, except charcoal, were separated from each sample. Seed identification is based on the author's comparative collection and on seed identification manuals (Martin and Barkley 1961; Montgomery 1978; Munsil 1978).

Results

The results of the analysis are presented in Tables 9.3 and 9.4. The 523 identifiable or potentially identifiable macrobotanical remains include cactus spines, seeds, and a pine needle fragment. The vast majority of these remains, 92%, are charred cactus spines. Macrobotanical remains were recovered from 21 of the 22 flotation samples and four of the nine botanical samples. The charred remains represent a minimum of six species, and the uncharred remains represent a minimum of three species.

Table 9.2

Flotation Sample Size and Charcoal Amounts (volume amounts in liters)

Sample Number	Original Volume	Lt Fraction Volume	Hvy Fraction Volume	Lt Fraction Charcoal*	Hvy Fraction Charcoal*
1089	1.56	.006	.310	H	T
1131	1.00	.028	.200	A	T
1134	1.20	.022	.220	A	T
1136	1.20	.032	.190	H	T
1137	1.04	.016	.180	H	T
1197	1.05	.014	.180	H	T
1199	1.00	.035	.120	M	T
1245	1.30	.015	.080	H	T
1311	.94	.012	.090	H	T
1312	1.22	.021	.100	H	T
1313	1.20	.019	.120	M	T
1315	1.02	.008	.080	H	T
1316	1.00	.014	.090	H	T
1322	.92	.005	.050	H	T
1323	1.21	.006	.060	M	T
1326	1.50	.011	.210	H	T
1460	1.07	.010	.120	H	T
1476	1.30	.020	.200	M	T
1482	1.00	.020	.070	M	T
1484	.82	.004	.100	H	T
1485	.78	.015	.060	L	T
1530	1.18	.016	.090	H	T
TOTAL	24.51	.349	2.92		

*Charcoal Amounts: T=Trace (<1%, by volume); L=Light (1-10%); M=Moderate (11-50%); H=Heavy (51-90%); A-Abundant (>91%)

Table 9.3

Macrobotanical Results
(*denotes botanical sample; otherwise sample is a flotation sample)

FS#	Identification	Common Name	Part	Charred Whole/Frag.		Uncharred Whole/Frag.
1089	cf *Chenopodium*	Goosefoot	seed			1
	Leguminosae	Pea Family	seed			2
	Opuntia	Prickly Pear	spine		20	
	cf. *Pinus edulis*	Piñon Pine	needle	1		
1131	*Chenopodium*	Goosefoot	seed	1		
	Opuntia	Prickly Pear	spine		30	
	Unknown	Unknown	seed?		1	
1134	*Chenopodium*	Goosefoot	seed	1		
	Opuntia	Prickly Pear	spine		10	
1136	*Chenopodium*	Goosefoot	seed		2	
	Opuntia	Prickly Pear	spine		50	
	Unknown	Unknown	seed		1	
1137	*Chenopodium*	Goosefoot	seed		1	
	Opuntia	Prickly Pear	spine		30	
1197	*Chenopodium*	Goosefoot	seed	1		
	Opuntia	Prickly Pear	spine		10	
1199	*Chenopodium*	Goosefoot	seed	3		
	Opuntia	Prickly Pear	spine		35	
	cf *Rhus trilobata*	Skunkbrush	seed	1		
1245	*Chenopodium*	Goosefoot	seed		1	
	Opuntia	Prickly Pear	spine		10	
1311	*Chenopodium*	Goosefoot	seed	1		
	Juniperus	Juniper	seed		1	
	Opuntia	Prickly Pear	spine		10	
1312	*Chenopodium*	Goosefoot	seed		1	
	Opuntia	Prickly Pear	spine		25	
1313	*Chenopodium*	Goosefoot	seed	1		
	Opuntia	Prickly Pear	spine		50	
	Prunus	Cherry	seed	1		
1314*	*Polygonum/ Rumex*	Buckwheat/ Dock	seed			1
1315	*Opuntia*	Prickly Pear	spine		30	

Table 9.3 (cont'd)

FS#	Identification	Common Name	Part	Charred Whole/Frag.		Uncharred Whole/Frag.	
1316	*Chenopodium*	Goosefoot	seed	2			
	Opuntia	Prickly Pear	spine		30		
1317*	Unknown	Unknown	seed?				2
1319*	Bug Part	---------------	--------				
1320*	Uncharred Bone Fragment	---------------	--------				
1321*	Unknown	Unknown	seed?				1
1322	*Chenopodium*	Goosefoot	seed		1		
	Opuntia	Prickly Pear	spine		10		
1323	*Chenopodium*	Goosefoot	seed		2		
	Opuntia	Prickly Pear	spine		1		
1324*	Charred Bone (Tooth) Fragment	---------------	--------				
1326	*Chenopodium*	Goosefoot	seed		1		
	Opuntia	Prickly Pear	spine		20		
1460a	*Chenopodium*	Goosefoot	seed	2			
	Opuntia	Prickly Pear	spine		30		
	Unknown	Unknown	seed		1		
	Unknown	Unknown	seed?				1
1460b*	*Prunus*	Cherry	seed		1		
1476	*Chenopodium*	Goosefoot	seed		1		
	Opuntia	Prickly Pear	spine		50		
1481*	Probable Bug Part	---------------	--------				
1482	*Opuntia*	Prickly Pear	spine		1		
1484	*Opuntia*	Prickly Pear	spine		20		
1485	None	---------------	--------				
1530a*	Rock	---------------	--------				
1530b	*Chenopodium*	Goosefoot	seed	3			
	Opuntia	Prickly Pear	spine		10		
Total				17	498	4	4

Note: Many of the spine counts are estimated.

Table 9.4

Bone and Lithic Remains from the Flotation Samples

FS #	Bone Fgmts*	Lithics	FS #	Bone Fgmts*	Lithics
1089	1 / 0	0	1315	3 / 0	0
1131	1 / 2	0	1316	0 / 0	0
1134	0 / 1	0	1322	0 / 1	1
1136	0 / 2	0	1323	1 / 2	1
1137	0 / 0	0	1326	2 / 2	0
1197	0 / 2	1	1460	0 / 0	0
1199	1 / 0	0	1476	1 / 1	0
1245	0 / 0	0	1482	0 / 0	3
1311	0 / 3	0	1484	0 / 0	0
1312	1 / 0	1	1485	0 / 0	0
1313	0 / 1	1	1531	0 / 0	1?
TOTALS	5 / 11	3		7 / 5	6

*Bone Fragments = charred / uncharred

Charcoal was noted in all of the flotation samples (Table 9.2). Generally the charcoal remains consist of moderate to heavy amounts of minute pieces. Although most of the charcoal pieces are too fragmentary to be identified, several pieces of probably piñon pine (*Pinus* cf. *edulis*) were observed.

Bone fragments were also recovered from 14 of the flotation samples (Table 9.4). Twelve of the 28 bone fragments are charred. The majority of the bone consists of tiny fragments which are probably unidentifiable.

The nine lithics are associated with seven of the flotation samples (Table 9.4) Generally these are small interior chert or chalcedony flakes.

Distribution and Economic Uses of Represented Species

Approximately 98% of the macrobotanical remains are charred. The uncharred macrobotanical remains are probably contaminants in the archaeological record. This concept is based on the modern condition of the seeds, the unlikelihood that uncharred seeds preserve through time under these conditions (Gasser 1981:235; Minnis 1981), and the availability of the seeds in the present local environment.

As mentioned above, the charred remains represent a minimum of six species. These remains consist of an estimated 482 prickly pear spines (*Opuntia*), 25 goosefoot seeds (*Chenopodium*), two cherry (*Prunus*) seeds, a probable pine needle fragment (*Pinus edulis*), a juniper (*Juniperus*) seed, and a probable skunkbrush (*Rhus trilobata*) seed. Three charred probable seeds are unidentifiable.

The charred remains are discussed below in descending order of frequency. A brief description of the plant, in addition to some ecological considerations, are also discussed. The ethnographic information provides insight into possible procurement, preparation, and use of a particular plant.

Prickly Pear (*Opuntia*). The 482 prickly pear spines were recovered from 21 of the 22 flotation samples. The only flotation sample without spines is Feature 7a, a depression in the work area southeast of the main pit house (Flotation Sample 1485). It is possible that these spines are from another cactus, such as the nipple cactus (*Coryphantha*), the hedgehog cactus (*Echinocereus*), or ball cactus (*Pediocactus*), but they compare favorably to those of a prickly pear. Although the actual number of spines was estimated in many cases, most samples contained 10 to 30 spines, with three samples containing approximately 50 spines each (Flotation Samples 1136, 1313, and 1476), and two samples containing only one each (Flotation Samples 1323 and 1482). The spines are fairly evenly distributed between floor and feature samples with no apparent cultural pattern to their distribution.

Several prickly pear species presently grow in the region (Harrington 1979:382-384; Weber 1987:190-191, 1976:89-90). Many ethnographic accounts note the consumption of raw or cooked prickly pear fruits (Bye 1972:97; Castetter 1935:35; Cushing 1920:237,264; Gilmore 1977:52; Harrington 1967:248; Kelly 1964:45; Newberry 1888:37; Robbins *et al.* 1916:62; Steward 1933:26; Vestal 1952:37; Whiting 1939:85; Yanovsky 1936:45,46). The late nineteenth century ethnographer Edward Palmer notes that: "The fresh unripe fruit is often boiled in water...becomes stimulating and nutritious" (1871:418). The raw or roasted pads were also eaten (Chamberlin 1911:375; Harrington 1967:249; Stewart 1938:26; Whiting 1939:85; Yanovsky 1936:45,46), as were the raw or parched seeds (Balls 1962:36; Castetter 1935:36; Harrington 1967:249), and the flower buds (Balls 1962:35; Kelly 1964:45).

Numerous medicinal uses of prickly pear have also been reported. The pad pulp was applied to wounds to lessen pain and promote healing (Balls 1962:35; Gilmore 1977:52; Johnston 1970:316; Niethammer 1974:20; Rogers 1980:61). Spines were rubbed into warts and moles (Balls 1962:35). Among the Blackfoot of the northwest Great Plains the spines were stuck into wounds and ignited and those which "sputtered and sparked the most were thought to have done the most good" (Johnston 1970:316). A tea to cure urinary tract problems was made of the roots (Rogers 1980:61).

Utilitarian uses of prickly pear are also noted in ethnographic accounts. The crushed leaf juice was rubbed on unfired clay vessels to close up the pores and to form a glaze (Cushing 1920:312,326; Johnston 1970:316). The juice was also used to fix the colors on painted hides (Gilmore 1977:52; Rogers 1980:61).

Collection of prickly pear fruits and pads requires special care as they are covered with spines, and a forked stick was often used to detach the segments (Balls 1962:35; Castetter 1935:36,37; Cushing 1920:237,238; Vestal 1952:37). The spines were brushed off with a bunch of grass or twigs (Balls 1962:35), or removed from the fruit by rolling, burning or rubbing the fruit with a stone (Castetter 1935:35,36,37; Cushing 1920:236; Harrington 1967:248; Vestal 1952:37).

Several reports indicate that various prickly pear parts were dried and stored for future use. These parts include the pads (Balls 1962:35; Rogers 1980:61; Vestal 1952:37); the seeds (Balls 1962:36; Harrington 1967:249); and the fruits, often with the seeds (Castetter 1935:35,36,37; Cushing 1920:238; Gilmore 1977:52; Harrington 1967:249). Other reports indicate that prickly pear was not stored (Kelly 1964:45; Steward 1938:26).

The spines recovered from the Yarmony site may reflect prehistoric prickly pear use and/or may be the remains of prickly pears growing on the roof when the structure burned. The recovery of the spines from diverse contexts without any apparent cultural pattern to the distribution supports the concept that the spines may not be the result of intentional prickly pear use.

There are also indications that the spines reflect the consumption of prickly pear pads (stems). It is interesting to note that no prickly pear seeds were recovered. Although there is not direct evidence, this may indicate that the spines are from the pads as opposed to the fruit. If the spines reflect pad consumption, there is some ethnographic evidence indicating a winter or early spring occupation. These seasons were often the harshest for prehistoric populations who had depleted their stored resources before the spring plants were available. Several ethnographic accounts mention that prickly pear pads were considered a "starvation food." Gilmore (1977:52) notes that "Sometimes from scarcity of food the Indians had to resort to the stems, which they roasted after first removing the spines." Similarly, Kelly (1964:45), when speaking of the southern Paiute, states that the "fleshy core" of cactus was "eaten mostly winter and spring, in times of stress." The pueblo Indians of northern New Mexico ate many species of prickly pear fruits and stems, some of which were considered less than choice: "The stems and fruits of *O. clavata*, *ishikana*, are similarly roasted and eaten in times of food shortage, although the stem sections are almost without flavor and also contain large quantities of a mucilaginous substance which render them rather objectionable" (Castetter 1935:35).

Goosefoot (*Chenopodium* sp.). The 25 goosefoot or probable goosefoot seeds were recovered from 17 of the flotation samples. As with the prickly pear spines, the seeds are fairly evenly distributed within these samples with no more than three seeds per sample.

Several goosefoot species grow presently in the region. Many of these were probably introduced from Europe or Asia, including *C. album* and *C. capitatum*, but several species are probably native, such as *C. berlandieri* and *C. desiccatum* (Thornton *et al.* 1974:56; U.S.D.A. 1971:132; Weber 1987:211-215). Goosefoot plants range in height from a few centimeters to over a meter tall and tend to be weedy. They produce small black seeds, averaging about 72,000 per plant (Alley and Lee 1979:56).

The use of goosefoot is well documented in both the archaeological and ethnographic record. The seeds are edible and the plant can be eaten as greens or a potherb (Bye 1972:97, 1979; Gilmore 1913b:361, 1977:26; Harrington 1967:71; Rogers 1980:66; Yanovsky 1936:22). The flowers of some species are also edible (Yanovsky 1936:22). Other uses include numerous external and internal medicinal applications (Niethammer 1974:114; Stevenson 1915:45; Steward 1933:317; Zigmond 1981:19), as a green dye (Gilmore 1977:26; Johnston 1970:311; Rogers 1980:66), and the making of soap from the roots (Zigmond 1981:19).

The ethnographic literature relates several possible methods of seed collection. One of these methods involves beating the plant, causing the seeds to fall into the container (Cushing 1920:244-245). Another method involves collecting and drying the seed clusters before thrashing out the seeds (Steward 1933:243). The seeds can be eaten at the time of collection, or stored for future use (Castetter 1935:23; Vestal 1952:25).

It is probable these goosefoot seeds reflect prehistoric consumption of the species, although they may also represent incidental inclusion in the cultural context. As mentioned above, goosefoot is a weedy species, which can be locally abundant and has a tendency to grow in disturbed places. As with the prickly pear, the plants may have been growing on the roof when the structure burned.

Cherry (*Prunus*). Two cherry seeds (stones) were recovered from the main pit house. One of these is from the floor of the pit house (Flotation Sample 1313), and a fragment was recovered from Feature 6 (Botanical Sample 1460b).

These seeds may represent chokecherry (*Prunus* [*Padus*] *virginiana*) or pin cherry (*Prunus pennsylvanica*), both of which are currently growing in central Colorado (Harrington 1979:308; Weber 1987:443, 1976:299). Several ethnographic accounts note that wild cherry fruits were eaten, and were often dried and stored for future use (Cushing 1920:242; Gilmore 1913a:326, 1913b:364; Harrington 1967:258; Steward 1938:28). Timbrook (1982:162-176) reports that the cherry pits are relished by several California Indian groups. The two cherry seeds associated with the Yarmony pit house probably represent the prehistoric consumption of the fruits.

Piñon Pine (*Pinus edulis*). A pine needle fragment is associated with the oxidized area outside of the main pit house (Flotation Sample 1089). The pine needle probably reflects the use of pine wood for fuel.

Juniper (*Juniperus*). A juniper seed was recovered from the floor of the main pit house (Flotation Sample 1311). As with the pine needle fragment, this seed probably reflects the use of juniper wood for fuel.

Skunkbrush (*Rhus trilobata*). A probable skunkbrush seed was recovered from Feature 3, a slab-lined cist in the work area (Flotation Sample 1199). Skunkbrush, a moderately sized shrub with clusters of sticky red berries, currently grows throughout much of Colorado (Harrington 1979:364; Weber 1976:76, 1987:84).

Historically, the berries were eaten (Bye 1972:92; Castetter 1935:48-49; Harrington 1967:260-262; Murphey 1959:17; Palmer 1878:597; Vestal 1952:35;

Whiting 1939:84), and the twigs had several utilitarian uses (Bye 1972:92; Harrington 1967:260-262; Murphey 1959:53; Palmer 1878:597; Stevenson 1915:81; Whiting 1939:84). The skunkbrush seed associated with Yarmony house probably represents the prehistoric consumption of the fruit.

Summary and Conclusions

Approximately 515 charred macrobotanical remains are associated with 22 flotation samples and nine botanical samples from site 5EA799 in Eagle County, central Colorado. The cultural remains at this site include the remains of a pit house with numerous associated features and artifacts. The pit house dates to approximately 6300 BP.

The charred macrobotanical assemblage represents a minimum of six taxa. The remains consist of 482 prickly pear spines (*Opuntia*), 25 goosefoot seeds (*Chenopodium*), two cherry (*Prunus*) seeds, a probable pine needle fragment (*Pinus edulis*), a juniper (*Juniperus*) seed, and a probable skunkbrush (*Rhus trilobata*) seed. Three charred probable seeds are unidentifiable.

Lithics and bone fragments were also recovered from the samples. The nine lithics are primarily small interior flakes. Slightly less than half of the 28 bone fragments are charred, and most are small, fragmentary, and unidentifiable.

Although the prickly pear spines and goosefoot seeds probably represent the intentional prehistoric use of these species, they may also be remnants of plants growing on the pit house roof when the structure burned. The prickly pear spines may be the result of prickly pear pad consumption during the late winter and early spring when both fresh and stored plant resources were scarce. The pine and juniper remains are probably fuel remnants, and the cherry and skunkbrush seeds most likely reflect the consumption of these fruits. Several ethnographic accounts offer insight into the possible collection and use of the plants.

Pollen Analysis

by
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Introduction

Pollen analyses were carried out on six soil samples and four ground stone artifacts (Table 9.5) from 5EA799, the Yarmony site, northern Eagle County, Colorado. The site, which includes an Archaic pithouse, is at an elevation of 7,140 feet. Local vegetation is big sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus* spp.), Rocky Mountain juniper (*Juniperus scopulorum*), prickly pear cactus (*Opuntia compressa*), ball cactus (*Pediocactus simpsonii*), grasses and herbs, but montane and subalpine communities - dominated by conifer species - are located close by on Yarmony Mountain (ca. 4 km to the northwest) and Piney Ridge (ca. 2 km to the south).

Table 9.5

Provenience and Count Data, 5EA799

FS #	Provenience	# Grains	# Traverses*
1463	Surface sample	300	8.1 T
1473	Soil unit 3, 70-73 cmbs; control	65	35.4 T
1133	Bottom of Feature 2, slab-lined storage cist	3	19.1 T
1202	Bottom of Feature 3, slab-lined storage cist	3	19.0 T
1475	Feature 7b, unlined basin	41	70.8 T
1486	Feature 9, small slab-lined pit	36	70.8 T
910	Slab metate, n. edge of central hearth (Feature 5)	25	70.8 T
1260	Mano, south-central part of pithouse	42	70.8 T
1261	Mano, northwest part of pithouse	49	70.8 T
1265	Mano, west wall of pithouse	37	70.8 T

* 200X magnification = 35.4 traverses total

Methods

Pollen was extracted from the soil samples following procedures adapted from Mehringer (1967) and Schoenwetter (personal communication, 1975). These involve flotation and screening of the samples, solution of the inorganic fraction in hydrochloric acid, hydrofluoric acid, and nitric acid, and reduction of the organic fraction with caustic soda and acetolysis solution. All samples required increased boiling times to allow for the elevation of the laboratory. The residues were stained with fuschin and mounted in glycerin for analysis.

Pollen densities and preservation were generally poor in the prehistoric samples (Table 9.5); all slides were counted at low (200X) magnification. Inmost cases the entire slide had to be counted and in many instances, two slides were analyzed. Abundant, well-preserved pollen was recovered only in the surface sample where a 300-count was achieved. The pollen sum excludes the pre-Quaternary pollen grains commonly recovered in the fossil samples. I am not trained in pre-Quaternary palynology, and was only able to identify one genus, *Aquilapollenites*, common in upper Cretaceous rocks of the western U.S.

Pollen Data

The percentage pollen data are recorded in Table 9.6 and illustrated in Figure 9.1. FS 1463, the surface sample, was collected north of the house in mixed sagebrush and grasses (Black, personal communication). It is the only sample to contain abundant and relatively well-preserved pollen. The pollen spectrum is dominated by arboreal pollen (AP = 71.3%) with 53.5% *Pinus* (pine), 6% *Picea* (spruce), .7% *Pseudotsuga* (Douglas-fir), 1% *Abies* (fir), .7% *Alnus* (alder), .3% *Betula* (birch), and 9.3% *Juniperus* (juniper). Only the latter is found at the site today; as noted above, the montane and subalpine species are located on higher land within two kilometers of the site. *Artemisia* is also important in the pollen record with 11.6%, but Gramineae (grass family) percentages are fairly low with 6.3%. Other recorded pollen types are Cheno-Ams (goosefoot-amaranth group) (5%), Compositae-Tubuliflorae (sunflower family) (4%), Onagraceae (evening primrose family), and Ranunculaceae (buttercup family).

FS 1473 is a control sample from Soil Unit 3, roughly contemporaneous with the pithouse occupation (ca. 6300 BP). Pollen recovery was poorer than the surface sample discussed above, but significantly better than any of the remaining fossil samples (see Table 9.5). The pollen record is similar to FS 1463 with high *Pinus* (69.2%) and *Juniperus* (6.2%). *Picea* and *Artemisia* percentages are much reduced, however, with 1.5% each.

Four soil samples from slab-lined (FS 1486, 1133 and 1202) and unlined (FS 1475) storage cists in the house basins were submitted for analysis. Pollen recovery in FS 1133 and FS 1202 proved so low that only three grains were recovered in half-slide counts from each sample. In Table 9.6, the taxa are noted by an 'X' only as percentage data cannot be calculated. Two slides each were analyzed for the remaining two samples, and total counts remain low. The pollen spectra of FS 1475 and FS 1486 are characterized by moderate *Pinus* percentages (47.6% and 52.8%), and low *Artemisia* values (< 6%). *Juniperus* percentage in FS 1475 (9.5%) correlates with the surface and subsurface control samples, while the value recorded in FS 1486 is low (2.8%). Similarly, a value of 9.5% Gramineae in FS 1475 corresponds to the control samples while the value of 22.2% recorded in FS 1486 is most similar to the other fossil samples. A peak percentage of 26.2% Cheno-Am pollen is registered in FS 1475. Pre-Quaternary pollen, including *Aquilapollenites*, were recovered in three of the four samples.

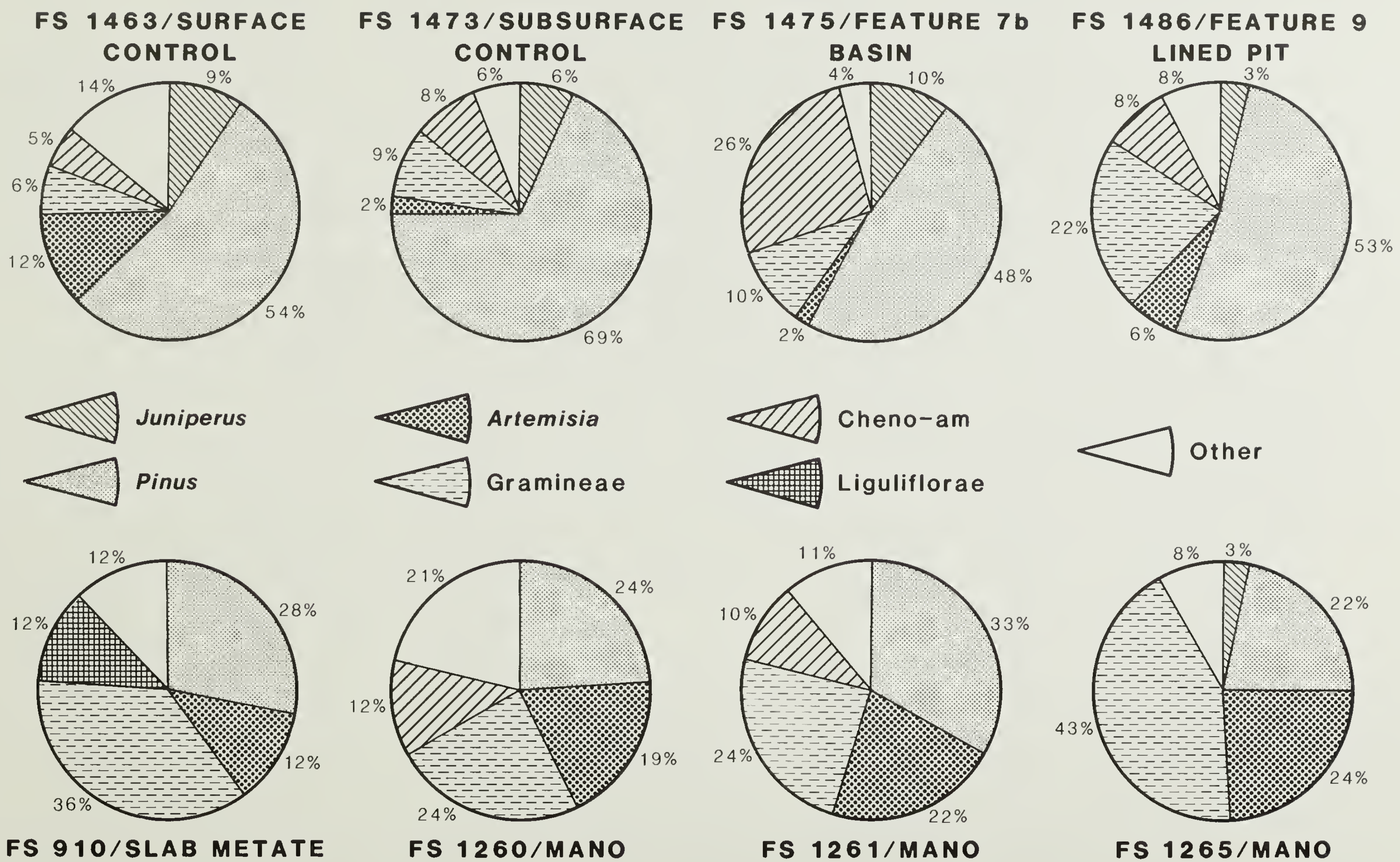
The final four samples are from ground stone artifacts, one slab metate (FS 910) and three manos (FS 1260, 1261, and 1265). Pollen recovery was poor and two slides had to be analyzed for each sample, with low total counts. The pollen spectra are distinct from those discussed above: low *Pinus* (22-33%) [and less AP in general], high *Artemisia* (12-24%), high Gramineae (24-43%), and high pre-Quaternary (24-50%). Members of the Compositae family are recovered in all samples, but the value of 12% Compositae-Liguliflorae in FS 910 is noteworthy. It is also important to note that a clump of eight Gramineae pollen grains (counted as <u>one</u> observation) was recovered in FS 1265. Clumps -which are very heavy and do not travel easily - are indicative of close contact between the sample (i.e., the grinding surface) and the plant. Other local taxa that were recovered include *Opuntia* (prickly-pear), *Polemonium* (Jacob's ladder), and Cyperaceae (sedge family).

Table 9.6

Pollen Percentage Data, 5EA799

FS #	*Juniperus*	*Picea*	*Pinus*	*Artemisia*	Cheno-Am	Liguli-florae	Tubuli-florae	Gramineae	*Opuntia*	Other	AP	Pre-Quaternary*
1463	9.3	6.0	53.5	11.6	5.0		4.0	6.3		4.3	71.3	
1473	6.2	1.5	69.2	1.5	7.7	1.5		9.2	1.5		76.9	
1133			x					x				
1202			x							x		x
1475	9.5		47.6	2.4	26.2	2.4	2.4	9.5			57.1	9.5
1486	2.8		52.8	5.6	8.3		2.8	22.2		2.8	58.3	8.3
910			28.0	12.0	4.0	12.0		36.0		8.0	28.0	28.0
1260	2.4	4.8	23.8	19.0	12.0	4.8	2.4	23.8	2.4	4.8	31.0	45.2
1261			32.7	22.4	10.2	2.0	4.0	24.4	2.0	2.0	32.7	50.0
1265	2.7		21.6	24.3			2.7	43.2+	2.7	2.7	24.3	24.3

*Not in pollen sum
+Clumps observed



POLLEN PERCENTAGES

FIGURE 9.1

Discussion

The surface and control samples and the storage cist samples form one group of samples in this study while the ground stone artifacts form a second. The pollen spectra of the first group are dominated by AP, especially pine. This contrasts with the pollen spectra of group 2 which is characterized by lower pine and high sage and grass percentages. Pre-Quaternary percentages are high in the second group although they were also recovered from the storage cist samples.

These data suggest the ground stone samples are significantly different from the both the modern background pollen rain and the contemporaneous pollen deposition (FS 1473 and the cist samples). The two cist soil samples contain slightly less AP and more NAP (non-arboreal pollen) than FS 1463 and FS 1473, but they are still distinct from the second group of samples. The high chenopod-amaranth percentage in FS 1475 and the high grass value in FS 1486 are interesting, but because only two cists contained sufficient pollen to analyze, it is difficult to say conclusively that those plants were being stored in the respective cists. Certainly plants from both groups are known to have been important food sources, both in the ethnographic and archeological literature. And unlike many economic species, high percentages of Cheno-am pollen can result from use of the seeds, leaves, or flowers (Bryant 1975).

Based on the ground stone analyses, it is suggested that grasses and sage were being utilized for food at the site. If the ground stone artifacts had been exposed to the contemporaneous pollen rain after use, it is expected that higher pine values would be observed. The pollen spectra do not suggest contamination, however. The high Liguliflorae value in FS 910, the metate, is also intriguing. Liguliflorae types are insect-pollinated and large percentages usually indicate importation into a site. Members of the Liguliflorae subgroup include *Taraxacum* (dandelion), *Agoseris* (false dandelion), and *Crepis* (hawksbeard).

Land Mollusk Analysis

by
Anne McKibbin

During excavations at Yarmony, numerous land snail shells were observed and collected from the site deposits. Land snails have been used in numerous studies, both archaeological and otherwise, to help understanding paleoenvironment and vegetation communities (see Evans [1972] or Sparks [1970]). Shells from 41 proveniences were sent to Dr. Shi-Kuei Wu at the University of Colorado Museum in Boulder for identification. Table 9.7 lists his identifications. Table 9.8 presents the distribution of occurrences (not counts) of species by component for the identified assemblage. It is important to recognize that the items submitted for identification were selected non-randomly from the whole assemblage.

Five species or groups were identified from the collection. These are the Succineid group, *Vallonia* sp., *Pupilla* sp., *Columella* sp., and *Zonitoides* sp. The following environmental information is summarized for these five snails:

Table 9.7

Identified Land Mollusks

FS #	Provenience	Component	Identification
446	130N 96E, 25-30 cmbs	Soil Unit 4	Succineid
490	131N 97E, 40-45 cmbs	Soil Unit 4	Succineid
495	131N 97E, 45-50 cmbs	House 2 fill	Succineid
498	131N 96E, 45-50 cmbs	House 2 fill	Succineid
551	130N 97E, 50-55 cmbs	House 2 fill	Succineid
591	131N 96E, 60-65 cmbs	House 2 fill	Succineid
594	130N 97E, 65-70 cmbs	House 2 fill	Succineid
819	134N 99E, 5-15 cmbs	Soil Unit 5	Succineid
894	136N 100E, 85-90 cmbs	House 1 fill	Succineid
1131	Feature 1 fill	House 1	*Zonitoides* sp.
1136	Feature 2 fill	House 1	Succineid, *Pupilla* sp., *Zonitoides arboreus* (Say), *Vallonia* sp.
1137	Feature 1 fill	House 1	*Pupilla* sp.
1159	138N 98E, 27-37 cmbn	Soil Unit 4	*Zonitoides* sp.
1171	Feature 4	House 1	*Zonitoides* sp.
1184	Feature 3	House 1	*Zonitoides* sp.
1196	138N 98E, wall contact	House 1	Succineid, *Zonitoides* sp., *Vallonia gracilicostata* Reinhardt
1198	138N 98E, wall contact	House 1	*Zonitoides* sp.
1199	Feature 3 fill	House 1	*Zonitoides arboreus* (Say)
1200	Feature 3 fill	House 1	*Zonitoides arboreus* (Say)
1240	135N 98E, floor contact	House 1	Succineid, *Pupilla* sp.
1241	137N 98E, floor contact	House 1	Succineid
1242	137N 98E, floor contact	House 1	*Zonitoides* sp.
1245	136N 98E, floor contact	House 1	*Vallonia* sp.
1313	136N 99E, floor contact	House 1	*Pupilla blandi* Morse
1314	136N 100E, floor contact	House 1	*Zonitoides* sp., *Pupilla* sp.
1315	137N 100E, floor contact	House 1	Succineid
1316	137N 101E, 137-147 cmbd	House 1	Succineid, *Zonitoides* sp.

Table 9.7, cont'd

FS #	Provenience	Component	Identification
1317	137N 98E, Level 13	House 1 fill	*Pupilla* sp.
1318	137N 99E, floor contact	House 1	*Zonitoides* sp.
1319	137N 99E, 87-97 cmbn	House 1	Succineid, *Pupilla blandi* Morse, *Vallonia gracilicostata* Reinhardt
1320	138N 101E,	House 1 floor contact	Succineid, *Pupilla blandi* Morse, *Vallonia* sp., *Zonitoides arboreus* (Say)
1321	135N 99E, Level 14	House 1	Succineid, *Zonitoides* sp.
1324	136N 99E, Level 13	House 1	Succineid (complete shell)
1325	138N 100E, 130-135 cmbd1	House 1	*Zonitoides* sp.
1327	138N 99E, floor contact	House 1	*Zonitoides* sp., *Pupilla* sp.
1441	134N 103E, 90 cmbgs-contact	House 1	*Zonitoides* sp.
1460	Feature 6 fill	House 1	*Zonitoides* sp.
1476	Feature 7 fill	House 1	*Zonitoides arboreus* (Say)
1480	135N 99E, Level 18+	House 1	*Zonitoides* sp., *Pupilla* sp.
1481	134-135N 98-99E, Unit 4 soil	House 1 fill	*Zonitoides arboreus* (Say)
1530	136N 100E,	House 1 153-158 cmbd	*Vallonia* sp., *Columella alticola* (Ingersoll)

Table 9.8

Occurrences of Mollusks by Component

Component	Succineid	*Vallonia* sp.	*Pupilla* sp.	*Columella* sp.	*Zonitoides* sp.	Total
Soil Unit 5	1					1
Soil Unit 4	2				1	3
House 2 fill	5					5
House 1 fill	1		1		1	3
House 1	10	6	9	1	20	46
TOTALS	19	6	10	1	22	58

Note: The values in this table list only occurrences of species, not total number of items, in the sample of land snail shells that was submitted for identification.

Succineid group: *Succinea grosvenori* thrives in an extremely wide range of conditions (Pilsbry 1948:821). It does well in conditions of considerable moisture during parts of the year, such as mud flats, and will also be found in semi-arid areas vegetated by sagebrush and yucca but avoids timbered areas (Hunt 1956:66). *Succinea lineata* is found primarily in two xeric habitats--on dry faces of loess bluffs in sheltered spots and in moist to wet but alkaline habitats (Pilsbry 1948:822). According to Dr. Wu, the group as a whole frequents the edges of bodies of water but may also be found in leaf litter in semi-arid environments.

Vallonia gracilicostata Reinhardt: Scott characterizes this species as an occupant of warm and arid habitats (1962). The genus Vallonia lives "under wood, stones and bricks, and at the roots of grass in lawns and gardens, and may almost always be found about ruined stone buildings, old walls, and the discarded flower pots and rubbish accumulating in neglected gardens" (Pilsbry 1948:1022). The western mountain states are among its distribution area (ibid.:1023).

Pupilla blandi Morse: Like Vallonia, Scott finds these snails in warm and arid environments (1962:32). Taylor (1965) characterizes the habitats of these snails as semi-arid to dry sub-humid, especially with cooler summers. Its range includes nearly all of the Rocky Mountains; in habitats including under wood and stones and leaf duff in moderately humid settings (Pilsbry 1948:927).

Columella alticola (Ingersoll): This snail is an inhabitant of montane zones over much of the Rocky Mountain region (Pilsbry 1948:1004-1005). No habitat descriptions were found.

Zonitoides arboreus (Say): Occurrence of this snail is widespread, having been documented in every area in North America, north of Mexico, with the exception of Nevada; in Colorado, it is found up to 10,000 feet (Pilsbry 1946:481,482). Its habitat includes anywhere where shelter is afforded and moisture is present, including forested areas, grass, under logs and stones (Pilsbry 1946:482; Hunt 1956:66).

In examining the distribution of shells in the various components, little can be concluded. All the snails can be expected to occur in the environment of the area and habitats present at the site. None are exotic, or indicative by themselves of any changes in moisture, temperature or vegetation regimes. Their presence, especially on the floor of House 1, is probably somewhat a function of the micro-habitat presented by the abandoned house pit. The depression undoubtedly served for numerous years as a small water collection basin while it was slowly filling with sediment. The clay-rich substrate (Soil Unit 1) further enhanced its water-holding capacity. There is pedological evidence of increased soil moisture in the fill of the basin (see Chapter 5). This situation would no doubt provide a more attractive environment for any of the species of snails identified in the assemblage.

Wood Sample Analysis

by
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Seven large fragments of carbonized wood and a piece of burned porous material which were recovered from the lower fill and floor contact zone in House 1 were submitted to the Wood Science Laboratory at Colorado State University for species identification. Dr. Craig E. Schuler analyzed this material. Each sample was chosen on the basis of preservation and provenience. The individual samples were the best preserved pieces of charcoal found in contexts within the basin of House 1. The pieces are thought, on the basis of provenience, to represent construction materials, although two or three samples could be from fuel wood instead. Table 9.9 lists these identifications.

All of these plants are available within 2 km, but today grow at elevations 150 m or more above the site in the montane forest along the flanks of Piney Ridge. Paleoenvironmental data discussed in Chapters 5 and 10 indicate that the lower limit of treeline was much closer to the site than today. In fact, the presence of the above species, together with more limited evidence of sagebrush, piñon, and juniper -the modern species on-site - is viewed as collaborative evidence of lowering of the lower treeline.

Table 9.9

Wood Species Identifications

FS Number	Species Identified	Provenience
Fs 1187	Douglas-fir	House 1 fill
Fs 1239	Lodgepole pine	House 1 fill
Fs 1242	conifer	House 1 floor scrape
Fs 1245	Lodgepole pine	House 1 floor scrape
Fs 1314	moss (no species i.d.)	House 1 floor scrape
Fs 1326	Lodgepole pine	House 1 floor scrape
Fs 1421	Englemann spruce	House 1 floor fill
Fs 1435	Douglas-fir (possible Englemann spruce)	House 1 roof fall

CHAPTER 10

RESEARCH CONTRIBUTIONS

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Introduction

This chapter examines the research contributions of the Yarmony site relative to problems outlined in the *Colorado Mountains Prehistoric Context* (Guthrie *et al.* 1984; Aivazian 1984), as well as to other questions which have come to light since that time. General problem domains covered include chronology and culture history, site location considerations, resource utilization, seasonality, technology, organization and mobility strategies, and paleoenvironment. Each of these is discussed in greater detail below.

The most exciting contribution of the site is, of course, the unexpected discovery of well-constructed, substantial pit houses in the mountain interior in an Early Archaic context. Corroborative evidence indicative of winter occupation is also of significance. Along with faunal data, pollen and macrofloral information, and technological attributes, the houses and their attendant storage facilities allow proposal of a new model of Archaic use of the mountain interior.

Another contribution worth highlighting is Madole's reconstruction of a general paleoenvironmental model for the area. This reconstruction shifts attention away from local events in the Front Range so often cited by archaeologists (Benedict 1978; 1985) to a broader-scale model dealing with the processes of climatic change in the Holocene. His conclusion that the Altithermal, as we have traditionally viewed it, did not exist in the mountains is of interest to archaeologists and others who deal with paleoclimate in the Rocky Mountain region.

Chronology

Stratigraphic relationships, projectile point styles, ceramic styles, and radiocarbon dates all provide chronological data at Yarmony. These are discussed in detail throughout this report and need only summary treatment here.

Stratigraphy

Five strata are recognized at Yarmony. Unit 1, a mid-Pleistocene landslide or debris flow deposit, predates human occupation. Holocene fill rests disconformably on top of the eroded surface of this deposit. Unit 2, cultural in origin and limited in extent, overlies this disconformity only in the House Locus. Unit 2 is Early Archaic in age with a maximum date of just over 7000 BP deriving from disseminated charcoal in an activity area at the Unit 1/Unit 2 contact. Unit 2 deposits in the House locus bear a range of dates between about

6000 BP to just over 6300 BP. Unit 3, a natural unit, overlies Unit 1 where Unit 2 is absent. Unit 3 is present in all site areas, and is believed to be more or less coeval with Unit 2, although it overlies Unit 2, or is mixed with it, in places. It is an alluvium which filled shallow paleochannels and also the abandoned house basins. Color and the presence of numerous gastropods suggest it accumulated in a water-rich environment.

Unit 4 is a widespread sheetwash alluvium bounded above and below by disconformities. The basal part of the unit may be as old or older than 4710 ± 90 BP, a date derived from Feature 14. Uppermost Unit 4 is older than 1230 ± 60 BP, the age of a charcoal stain at the Unit 4/Unit 5 contact. Unit 5 is a sandy soil which blankets the surface at the site. It lacks much soil development, and may be much more recent than the 1200 BP date at its lower boundary.

Thus, in broad perspective, the stratigraphic picture at the site is clear. Extensive burrowing (by rodents, badgers, and likely coyotes) within the fill of the house pits has mixed the deposits overlying the houses to an unfortunately high degree, however. The area of the site where most of the investigations have occurred is precisely the area where mixing is the worst.

The earliest occupation occurred at about 7050 ± 200 BP in the East Road Cut area. The extant Holocene deposition began accumulating at about the same time. Next in the known sequence is occupation of House 1 at more or less 6300 BP. There is an approximate 300 year hiatus during which House 1 burned and decomposed, followed by occupation of House 2 at more or less 6000 BP. Next in the dated sequence is the Feature 14 locus with a single date of 4710 ± 90 BP. The soils overlying House 1 contain numerous artifacts, while Unit 4 elsewhere has lower artifact densities. Some of these artifacts could derive from occupations contemporary with or later than Feature 14. The presence of later Archaic occupations is probable within the Unit 4 soil, but diagnostic features, dates, or projectile points have not been found, and mixing from underlying deposits could account for most of the material recovered from Unit 4 soils. The best evidence of discreet Late Archaic use of the site comes from a single test unit just west of House 2 where the Unit 4 soil has numerous artifacts and mixing is not thought to be a contributing factor. Solid evidence for Late Prehistoric occupation(s) occurs in the form of the 1230 ± 60 BP date, a small corner-notched projectile point, and the ceramics found within the Unit 5 soil.

Projectile Points

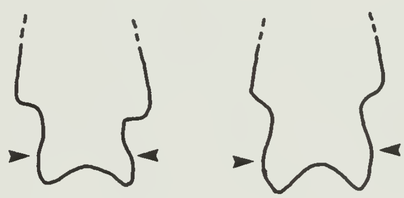
Although 36 diagnostic projectile points were recovered representing just two time periods, these are grouped into six types as discussed in detail in Chapter 7. The comparative base for each of these types is presented with the type description and only highlights are discussed here.

Our type 5 is most comparable to the Pinto type as described by Holmer (1986). This type has a temporal span on the Northern Colorado Plateau of about 8300 BP to 6200 BP and a geographical distribution that includes the Great Basin, southern Columbia Plateau, and Northern Colorado Plateau (Holmer 1986:99). Yarmony falls at the end of this temporal span, and is the eastern-most site with a major Pinto-like assemblage. Various observers have noted the similarity between Pinto points (both from Yarmony and elsewhere) and the Duncan-Hanna

variants of the Northwestern Plains McKean complex. Lister (1953), fairly early on, noted the widespread distribution of stemmed-indented base point forms in the West and suggested they might be a "horizon marker" for the Archaic. Green (1975) has explored technological differences between points of the Little Lake series (Humboldt-Pinto) and McKean Complex forms (McKean Lanceolate, Duncan and Hanna), and Holmer (1978) has performed a statistical analysis of projectile point forms. It can clearly be shown that McKean Lanceolate and Humboldt points are distinct in technology, form, and in time and space. The case is less clear for Pinto-Duncan-Hanna differences, but some differences are stated to exist.

Two aspects of Little Lake technology seem key to distinguishing between the two broad technologies. Parallel-oblique flaking is the strongest indicator of the Little Lake series, while the McKean series is characterized by collateral-expanding flaking patterns (Green 1975:167). Little Lake bases are formed in a two-stage process with steep longitudinal flakes driven off during the "blank" stage and, once the point is thinned and shaped, removing a series of narrow thinning flakes from the base. In contrast, McKean series bases are notched rather than thinned, and usually show crushing on the interior of the notch or concavity.

The type 5 points from Yarmony are more closely comparable to the Pinto types than to stemmed McKean variants. The tendency in flaking patterns is toward parallel flaking. Although some variety does exist, flaking on Yarmony type 5 points is not generally collateral-expanding. Basal concavities are formed by steep bifacial flaking rather than by basal thinning as in Little Lake technology. Perhaps the most distinct aspect of the Yarmony point forms is a slightly "fish-tailed" appearance to the stems (illustrated) formed by very broad side-notches producing a slight shoulder (arrow) above the base. Also of note in the Yarmony assemblage is a high incidence of serration of blade margins.



In sum, Yarmony type 5 points form a distinct assemblage which has closest temporal and technological affinities with Pinto technology on the Northern Colorado Plateau, but with some differences as well. It is important to note the presence of stemmed-indented base points in the Colorado mountains at 6300 BP. Benedict has recovered stemmed-indented bases high in the Front Range at Fourth of July Valley associated with charcoal dated at 6045 ± 120 BP and 5880 ± 120 BP (Benedict 1981:Fig. 67), at Coney Lake with a date of 5710 ± 110 BP (Benedict 1990:26) and at Hungry Whistler associated with a 5300 ± 130 BP date (Benedict and Olson 1978:Fig. 38), as well as in later contexts. In various publications, he has hypothesized that the McKean technocomplex evolved in mountain refuge areas during the Altithermal and spread onto the Plains at the onset of mid-Holocene mountain glaciation (e.g. Benedict 1990:65). The Yarmony assemblage lends additional support for early dates for stemmed-indented base technology in the mountains, and certainly does not contradict Benedict's hypothesis. This is, however, a problem whose answer will require additional data from widespread sources.

In Chapter 7 the similarity between our type 6 points and the Mount Albion type defined by Benedict (1978) is noted. Benedict (1978:126) has observed a continuum in styles between his classic Mount Albion point and later forms that involves reduction in size, greater use of curved flakes, increased use of cryptocrystalline materials, and abandonment of notch and basal grinding. The Mount Albion complex is well established in the Colorado Front Range by 5800-5600 BP and Benedict is inclined to terminate the date prior to 4800 BP. He thus excludes corner-notched forms from the Ptarmigan site with three dates in the 4700 BP range (Benedict 1978:135).

The Feature 14 points from Yarmony are typologically much more similar to the classic Mount Albion point than to the corner notched forms he cites at sites such as Magic Mountain, Spring Gulch, Dipper Gap and others. The presence of Mount Albion or Mount Albion-like points in a number of contexts, including Yarmony, the Ptarmigan site, Vail Pass (Gooding 1981), and Pontiac Pit (Leistman 1984), with dates clustering in the 4700 BP range suggests closer examination of the terminal dates for the Mount Albion Complex is in order. Based on the presence of just two specimens and a single date at Yarmony, we are hesitant to take this argument too far, but evidence is accumulating to address this problem.

Paleoenvironment

In Chapter 5, Madole presents a model of paleoenvironmental change in the Yarmony area. This model is somewhat at odds with the concept of an Altithermal, at least as regards the existence of this event anywhere south of the northern limits of the summer monsoon. This model, as well as independent data from pollen and archaeological sources are discussed here. Madole has chosen to interpret the paleoenvironmental sequence at Yarmony within the context of a model based on changes in earth-orbit parameters and atmospheric circulation-experiment models. Much of his data are from pollen and geological study sites within the central Colorado Mountains rather than from Yarmony proper. Thus, his focus is on a general model rather than on a fine-grained reconstruction of a single site.

Summarizing from Chapter 5, the features of the stratigraphic record at Yarmony that may have paleoclimatic significance are: (1) the prominent unconformity between strata of Pleistocene and Holocene age; (2) the absence of upper Pleistocene and lower Holocene sediment; (3) the thin cover of middle to upper Holocene sediment containing two minor disconformities, each marked by a weakly developed paleosol; (4) most Holocene sediment was deposited after about 6400 yr BP, initially in channels, and later in two blankets of sheetwash, the upper of which is distinctly sandier and less calcareous than the lower; and (5) the incision of arroyos and formation of small alluvial fans in near-historic and historic time.

Paleoclimatic-dependent episodes hypothesized include: (1) sheet and rill erosion and the formation of shallow channels mainly between 12,000 and 6000 BP during the period of intensified summer monsoons that culminated about 9000 BP; (2) higher mean annual temperature and precipitation at Yarmony at the time of house occupation relative to modern conditions; (3) lower limit of the montane forest much nearer the site at 6000 BP than today; (4) lowering of upper treeline and raising of lower treeline in middle to late Holocene time as summer temperature declined; (5) channels cut in early Holocene time became more

ephemeral and began to aggrade with sheetwash alluvium; (6) the late Holocene was a time of slow alluviation marked by two short intervals of stability; (7) these periods of stability may be coeval with periods of late Holocene cirque glacier advance at higher elevations; (8) modern arroyos in the Yarmony vicinity were probably not features of the landscape until the widespread period of arroyo cutting between 150 and 100 years ago.

Data from wood-identification lends some support for the general reconstruction above. The seven wood samples identified by Dr. Craig Schuler of the Wood Sciences lab at Colorado State University (Chapter 9), all from burned material in House 1, are from woody species from the montane forest which today grows at elevations 100 to 200 m above the site. The lack of materials from the site's modern vegetation regime, along with the presence of materials which Madole hypothesizes to have been present at Yarmony's elevation during the time of occupation of the houses, provides support for his model.

Pollen data, too, is generally supportive of lower treelines at about 6000 BP, although this information is not quite as strong, given that there is neither a continuous column nor especially well-preserved pollen. It is worth comparing the pollen diagrams for the modern surface control relative to the subsurface control sample from the base of the Holocene section (see Figure 9.1). Although the differences are not major, the relative percentages of *Pinus* and Gramineae are higher and the *Artemisia* and *Juniperus* are lower in the subsurface control, as would be expected if Yarmony were within, or on the edge of, montane forest.

The model presented by Madole utilizes the pollen records developed in the Crested Butte area (Markgraf and Scott 1981; Fall 1985, 1988) which do not show a major mid-Holocene drought, the earth-orbit parameter model of Kutzbach (1981) and others, and the local stratigraphic record in the Yarmony locale. His reconstruction clearly does not show an Altithermal episode, but does allow for episodes of Holocene cirque glacier advance. A lower treeline with a warmer, wetter climate would certainly make the Yarmony area more habitable than it appears today. The late Holocene cultural sequence at Yarmony is not yet well enough studied to contribute to the paleoenvironmental reconstruction.

Subsistence

Evidence concerning diet is surprisingly rich for an open site in the mountains. A large and varied faunal assemblage is complemented by positive, although somewhat meager results from flotation analysis, and by fruitful results from groundstone pollen washes taken from tools recovered from the floor of House 1. These analyses are reported in Chapter 9 in detail.

Faunal remains were recovered from six defined archaeological components, and from two unknown or disturbed contexts (Chapter 8). All of the bone is well preserved, albeit highly fragmented by cultural activities. Bone marrow extraction and grease production were important activities associated with each archaeological component. The intensity of bone processing is indicative of a situation where food stress/insecurity played an important role during the occupation of the site. The intensity of faunal processing is especially evident in the collection associated with House 1 where a winter occupation is hypothesized.

Elk, deer and possibly bison provided most of the meat and bone for marrow but the smaller mammals, birds and fish identified from the collection should not be overlooked in their importance to the diet. Although there is no clear evidence that the small rodents identified from the collection were used as food, it is possible pocket gophers, ground squirrels, marmots and woodrats were eaten. Lagomorph remains are a consistent feature in the Yarmony archaeofauna. Rabbits and/or hares were identified from each component and in terms of NISP provided a significant contribution to the diet. This is especially true in the large sample in House 1. An important aspect of the lagomorph bone from the site as a whole is the fact that it was processed for marrow and grease right along with the larger mammal bone. Bison remains are limited in the Yarmony collection, but the discovery of bison elements in House 2 and in the East Road Cut indicates availability during the Early Archaic and that they were utilized by Mountain oriented groups. It is possible that additional bison are represented in the elk/bison and unidentifiable large mammal categories used in this analysis.

Domestic dog remains along with several *Canis* bones were identified from House 1 and House 2. Burned and butchered canid elements indicates, not surprisingly, that dogs were used as a food source. Further, canid bones were used in the manufacture of ornaments.

The fish remains recovered from Yarmony present an interesting although not unexpected addition to the overall faunal assemblage. Yarmony is approximately one kilometer from the Colorado River which was the likely source of the fish. Suckers thrive in the backwater eddies in the river and would be relatively easy to catch with nets, spears or even by hand. Aquatic resources are not often found in mountain settings and are often very difficult to recover. Water screened soil samples from the floor of the pit houses produced all of the fish remains from Yarmony.

Fetal bone constitutes some of the best evidence for winter occupations at archaeological sites. At Yarmony, fetal bone is lacking from the houses, but one very fragmentary fetal element was recovered from Feature 14. This element could not be positively identified, although a newborn mountain sheep, or a seven month fetal bison are the most likely candidates. In either case, a late winter/early spring season of occupation is indicated.

Flotation samples were routinely collected from a variety of proveniences including all features, floor contact, and various places within the fill. In all, 24 flotation and nine botanical samples were analyzed. Most numerous were some 482 charred prickly pear spines recovered from 21 samples. These occurred throughout the floor and floor features of House 1, with no apparent pattern except that charred spines are absent from the two general fill samples analyzed from within House 1. Other identified plant remains include goosefoot (*Chenopodium* sp.) seeds a few of which were recovered from each of 17 of the samples, two cherry seeds, one juniper seed, and probably, a skunkbrush seed.

Interpreting the meaning of these results is somewhat problematic. Prickly pear is a well-known economic species with the fruits and pads both known to have been used, the latter generally as a "starvation" food. Use of the prickly pear involves removal of the spines, usually through rubbing or charring. The presence of charred spines is consistent with this practice, but it is difficult to account for spines being present all over the house interior. If prickly

pear were processed for storage, one would expect this to have been an outdoor activity. An alternative explanation is that the prickly pear was present on the roof of the house or in a partially collapsed abandoned house and that it was burned when the house burned. The presence of charred spines on the house floor and lack of charred spines in lower house fill is one argument against this explanation. A second would be the consistent degree of charring - it might be expected that spines caught in a house fire would be more completely carbonized. A possible alternative explanation is that unprocessed pads or fruits were stored against shortage; another might be that the pads were collected in the late winter or early spring in the face of a food shortage, and processed indoors.

The discovery of charred goosefoot seeds in archaeological context has become commonplace. It seems likely that these were an economic species at Yarmony, but in view of the extremely high number of seeds produced by goosefoot plants, the small number recovered at Yarmony might be seen as an argument that it was not an important species at this site. The age of the site, however, and the possibility of poor preservation should be taken into account also.

The few seeds of other plants are also worthy of mention. The wild cherry stones would not be likely candidates for natural introduction onto the house floor. Van Ness (Chapter 9), likewise feels the presence of a skunkbrush seed is probably a result of consumption. Juniper, present at the lower montane ecotone, could easily be introduced through use of juniper as a fuel wood.

Palynological analysis of four groundstone implements from the floor of House 1 is highly informative, especially in contrast to the level control sample and samples from within floor features and storage cists. These latter samples show high percentages of arboreal pollen, whereas the groundstone washes are high in grass and sage pollens, including a Gramineae pollen clump, which Short (Chapter 9) interprets as showing prehistoric economic use. A high Liguliflorae (dandelion tribe) value from the metate is also noteworthy. Finally, although the samples from Feature 7b and Feature 9 are generally similar to the control sample, Feature 7 is high in cheno-am pollen and Feature 9 is high in Gramineae pollen, both economic plants that could be expected to be stored and processed.

In sum, there is direct evidence from Yarmony of use of a wide variety of plant and animal resources. This is not unexpected from a site with a long term of occupation, but it is unusual for a mountain site. The variety of foodstuffs, and the intensity of processing very likely was necessary to support the winter sedentism in evidence here.

Architecture and the Early Archaic

Habitation structures and temporary structures of various kinds are being reported with increasing frequency from within Western North America and the Rocky Mountain region, with dates beginning in the Early Archaic Period, and continuing through the Late Prehistoric. The literature concerning these houses is, for the most part, either in limited distribution contract reports, or in unpublished conference papers (eg. Ames 1988; Green 1988; Metcalf and Black 1988b). Thus, detailed comparison of architectural details, associated features, and artifact assemblages has not been attempted by any of the investigators involved with such sites. Useful regional summaries include Ames (1988) for the Northwest Plateau, Green (1988) for the Snake River Plain-Northern Great Basin,

McGuire *et al.* (1984) and Harrell and McKern (1986) for the Wyoming Basin, and Cassells (1983) for western Colorado.

In addition to those at Yarmony, habitation structures have been reported from a number of sites in the Curecanti Basin west of Gunnison and at the Granby and Hill-Horn sites in Middle Park within the Southern Rockies of Colorado (Euler and Stiger 1981; Stiger 1981; Mueller and Stiger 1983; Jones 1982, 1984, 1986; Wheeler and Martin 1982). These occur in contexts as old as 8000 BP and continuing until at least 3300 BP. At Granby and Hill-Horn the evidence is sketchy as to the nature of the structures, consisting of large, irregular masses and chunks of burned stick- and log-impressed clay.

At Curecanti, Feature 1 at 5GN205 is a shallow charcoal-stained basin 16 cm deep and 3.5 in diameter (Euler and Stiger 1981:47). Within it was about 9 kg of log impressed adobe interpreted to be remains of the superstructure. House contents included both chipped and ground stone. Three dates include 4398 ± 90 BP (Tx-3150), 4563 ± 300 BP (Tx-3150) and 4697 ± 80 BP (Tx-3151). At 5GN10, the remains of four or five structures were found. All are interpreted as wickiup structures based on stain outlines, lack of structural pits, and the presence of burned pole-, stick- and grass-impressed clay. Dates on the features include 3924 ± 130 (Tx-3629) and 4244 ± 90 BP (Tx-3630) from a 5 m diameter stain (Feature 8), and 6355 ± 210 (Tx-3621) from the stain of Feature 12, a poorly defined structure, and 4058 ± 260 BP (Tx-3631) from Feature 13, a concentration of burned adobe and poles. Finally, the remains of two structures were found at 5GN247 (Jones 1986a:164-172). Feature 9 is a roughly circular shallow pit 4 m in diameter and just over 30 cm in depth. Within it were a partially slab lined hearth along the east arc of the house, an inverted slab metate, several bifaces, a hafted knife and an assemblage of largely quartzite flaking debris. A date from charcoal within the fill is 3689 ± 60 (Beta-3278). Feature 19 was not clearly definable, but yielded about 3.5 kg of stick- and vegetation-impressed burned clay, It yielded a date of 3399 ± 90 BP (Beta-3282).

Further west within the Colorado River valley, the slab-paved structure in the Sisyphus Shelter (Gooding and Shields 1985) dating at 2410 ± 70 (Dic-1660) is unique in the archaeological literature of the region. The Kewclaw pit house on Battlement Mesa (Conner and Langdon 1987) has two dates, 2900 ± 60 BP and 2770 ± 60 BP (Beta-3339, Beta-3840) and is associated with small and medium-sized corner-notched projectile points. This structure is a semi-circular pit structure with an approximate diameter of 4.5 to 5 m and a depth of about 65 cm. It contained an interior hearth, milling implements, a bone awl and several small corner-notched projectile points.

Archaic and Late Prehistoric sites in the Wyoming Basin also have been found with habitation structures in recent years. These include Shoreline (Frison 1978), Medicine House (McGuire *et al.* 1984), Maxon Ranch (Harrell and McKern 1986), Split Rock (Eaken 1987), Sweetwater Creek (Newberry and Harrison 1986) and several sites excavated in central Wyoming (Waitkus and Eckles 1988; Smith 1990). These have been classified under two general types (Harrell and McKern 1986:5.12), small, shallow house pits up to 70 cm in depth and about 3 m to 4 m in diameter, and a larger, more formal house type represented by the Medicine House and possibly by poorly preserved basins at the Shoreline Site. Medicine House, located along a now dry wash near the North Platte River, is about 6 m in diameter with interior hearths and storage features, milling bins,

and a ventilator shaft (McGuire *et al.* 1984). The smaller houses also have interior hearths and possible storage features, but lack other architectural elaborations. Among the Wyoming structures, Medicine House most resembles Yarmony in complexity, but the two are quite different otherwise.

Pit houses are reported from the Snake River Plain in Idaho at several sites dating between 4300 to 1000 BP (Green 1988). Green mentions both Late Prehistoric wickiups and "Plateau-type" pit houses, referring to rather substantial pit structures reported on the Columbia Plateau. The Plateau pit houses can be quite large, as much as 15 m in diameter, were sometimes built in two levels, and were used more or less continuously after about 5000 BP (Ames 1985). Those on the Snake River Plain range from 3.5 m to 7.5 m in diameter, usually have interior hearths, often are associated with external storage pits, and sometimes have exterior postholes (Green 1988:Table 1).

Pit structures are also fairly common in the eastern Great Basin such as in the Surprise Valley (O'Connell 1975; O'Connell and Ericson 1974), in the Humboldt Valley (Cowan and Clewlow 1968) and in the Warner Valley (Green 1988; Northwest Anthropological Association Newsletter, Vol. 2, no. 1). These apparently begin in the Early Archaic and give way to above-ground structures after about 1000 BP. They are descriptively similar to the Snake River structures, with most being in the 3.5 to 7 m diameter range.

A comparative synthesis of Archaic architecture in the west is beyond the intent of this paper. It is important to note, however, that the number of known residential structures is now quite large and is growing each year. There is a strong thread of continuity emerging which suggests that pit structure use has a long history in the region which culminated in the architecture of the Anasazi, Fremont and other Formative groups. An important aspect of this growing body of data is in the implications it carries for interpreting prehistoric settlement and subsistence strategies. For example, the presence of substantial structures has implications for group mobility, suggesting that seasonal sedentism may have been of importance. Investment in such a structure may also imply a strong tether to "place" much the same as communal hunting features such as high altitude game drives do. If the same groups who were living in pit houses were maintaining game drives at higher elevations, a strong commitment to a specific territory with regular, scheduled moves within it is implied. The degree of nomadism attributed to Archaic cultures may well be overestimated, at least in the mountains.

Seasonality

It has long been known that even the highest peaks were used on a seasonal basis by prehistoric populations (e.g. Ives 1942; Husted 1965), but a prevailing notion has been one of winter abandonment. In large part, this is due to an imbalance in published work, with the foothills and Front Range far better studied and reported than the mountain interior. Several investigators have speculated that interior mountain parks and valleys were used as winter residential areas, mostly on the basis of resource availability (e.g. Metcalf *et al.* 1981; Stiger 1981; Lischka *et al.* 1983; Black 1986), but prior to the excavations at Yarmony, there were no sites that could be demonstrated to be winter residences. Rather, winter use was hypothesized on the basis of resource potential. In addition to storable plant foods and stockpiled meat from warm

season hunts, big game animals winter in the parks and valleys. Deep snows at higher elevations concentrate animals within much smaller and predictable ranges at lower elevations - a sort of larder on the hoof.

In interpreting the results of a sampling survey of North Park, one of the larger mountain parks of Colorado, Lischka (Lischka *et al.* 1983:220-224) tentatively concludes that several stone circle sites may be winter habitations, but at the same time acknowledges that the evidence is circumstantial. Grady (1980:242-244) has modelled, also on the basis of survey data, an upland-lowland settlement dichotomy for the plateau country immediately west of the mountains. Winter range for deer and the productivity of the Piñon-Juniper zone are key components of this model which places groups in the river valleys and lower plateaus west of the mountains during the winter. This hypothesized pattern seems logically plausible. In all of these examples there is an argument for local populations with a mountain focus, but this idea is neither explicitly stated nor well supported by data from excavated sites.

In fact, there has been relatively little excavation in the mountain interior yielding information on seasonality of settlement. Further, statements concerning the archaeological expectations for seasonality of mountain sites have been few and general in nature. The underlying assumption has traditionally been of winter abandonment, and a resultant expectation has been for warm season use. Excavations at Yarmony have forced a re-examination of existing evidence and forced a more explicit statement of just what would be expected of a cold season site in the mountain interior - if, in fact, such sites are part of mountain settlement patterns. Winter occupation implies a complex suite of behavioral and technological strategies to insure survival and comfort. These behaviors and technologies should have resulted in recognizable archaeological remains. Foremost of these is the presence of the houses.

In a synthesis concerning seasonal mobility and pit house use in the southwest, Gilman (1987) performed a cross-cultural analysis of pit structure use in a sample of 84 societies world-wide where adequate ethnographic data exists. Based on this analysis, she presents the argument that aspects of pit house use are so consistent among these groups that three correlates of pit structure use can be accepted at the level of middle range theory (e.g. Binford 1983). Each of these correlates allows the generation of expectations that can be predicted to occur in the archaeological record. Correlates of pit structure use are (Gilman 1987:541):

1. A bi-seasonal or more mobile settlement pattern.
2. Cool-cold season use of the pit structures.
3. Dependence on food storage during the season of pit structure use.

Thus, a true pit house found anywhere should be indicative of cool-cold season use, storage facilities should be present, and there should be evidence for seasonal mobility.

For the mountain interior, expected archaeological remains fall into the categories of facilities, foodstuffs, assemblage characteristics, and aspects of site placement. Expected facilities include substantial shelters, associated storage facilities, and interior hearths for heating. The remains of storable plant foods should occur, and faunal evidence should show processing for the

rendering of marrow and fat for storage, in addition to butchering for meat. The presence of seed and fruit remains of plants known to have been use in pemmican might fall into this expected category as well.

Assemblage characteristics are essentially those which could be expected in any long-term habitation site. That is, a high diversity tool-kit reflective of the multiple activities that occur in and around domestic sites, accumulation of middens resulting from the length of occupation, and, in a winter site, evidence for storage or intensive use of lithic raw materials which have been rendered inaccessible by snow cover or frozen ground.

Aspects of the Yarmony site and assemblage which support the hypothesis of winter occupation include:

1. The presence of two or more substantial house structures.
2. Interior hearths within the houses.
3. Well constructed, varmint-proof interior storage bins.
4. Pollen and macrofloral remains of grasses, cactus, *Chenopodium* and other storable plant foods.
5. Faunal evidence which includes a wide range of small, medium, and large animals with butchery which shows extremely intensive processing of all species rabbit-sized and larger.
6. Maximal utilization of chipped stone materials in spite of the local availability of virtually all of the raw material types in use at the site.
7. Site placement within high-quality winter range of bison, elk, deer, and mountain sheep.
8. Site placement on a broad bench above the entrenched valley floor in a setting where the effect of cold-air drainage is minimal.
9. Site placement in a setting with adequate solar exposure.

Modelling Early Archaic Mobility Strategies in the Mountains

Introduction

Transhumance is perhaps the most widely used term in characterizing prehistoric seasonal use of the Rocky Mountains, at least in Colorado where the various mountain ranges form a wide band as much as 285 km across. In simplified form, models of prehistoric use have peoples migrating out of the mountains during the winter - to the sheltered hogbacks and river mouths at the base of the foothills on the east, and far down the river valleys onto the Colorado Plateau on the west. This simplistic reconstruction is based partly on poorly described patterns observed among the mountain-using Ute and Arapahoe in late historic times, and partly on the very sketchy archaeological record. Implied is a very clear bi-seasonal migration into and out of the mountains. Coupled with this is a very high degree of residential mobility linked to seasonal use of various elevations in the high country. Long-term residential bases are not supposed to occur; short term camps and special use locations should be the primary site types of the mountains. In fact, the Colorado Mountains research design (Guthrie *et al.* 1984) repeatedly questions whether there was an indigenous mountain-oriented culture, whether use was exclusively seasonal, or whether there was some mix of indigenous use with seasonal use by

lowland-based cultures. The discovery of substantial structural remains at Yarmony, dating between 6000 and 6300 BP, has allowed a revision in models of Early Archaic period use of Colorado's mountain interior.

Beginning with the inference of Yarmony as a winter residential base, a model of Early Archaic logistical organization is presented. Simply put, Early Archaic use of the mountain interior involved year around residency on the part of local groups who utilized a wide range of resources in an intensive and efficient manner within restricted annual territories. The key to this pattern is a winter residence located in proximity to a wide range of resources. The size of regularly used annual territory is hypothesized to be small, on the order of 500 to 1000 km^2. More important than overall size is that the use range include terrains at all elevations. Seasonal movements involved warm season use of the higher elevations and cool season use of the valleys and parks. Dependence on food storage during the winter was important: Resources procured at all elevations were returned to the winter residence for storage.

In modelling the seasonal organizational strategies we are generally following the forager-collector continuum of Binford (1980) in suggesting that the prehistoric organizational strategy was logistical. That is, much of the hunting and gathering activity involved small groups going on short-term excursions to acquire food and return it to a base for storage. Although both residential and logistical moves (Kelly 1983) occurred, the pattern was for relatively few residential moves relative to logistical trips by sub-groups.

Bender and Wright (1988) have recently presented a model of hunter-gatherer use of the high country, particularly the Middle Rocky Mountains. After reviewing previously held views of prehistoric use of the mountains, they argue for a "broad spectrum model" for use of the high country, meaning that a diverse array of resources were procured and utilized in the mountains as part of regularly scheduled visits on the part of lowland based groups. They stress the point that the total adaptation of prehistoric peoples to the region cannot be understood without including patterns of use of the high country.

Our model, developed independently from that of Bender and Wright, is similar in that it too stresses a broad spectrum or resources with regularly scheduled procurement, and we would agree that understanding prehistoric use of the high country is integral to understanding regional organizational patterns. Our major difference lies in our view that utilization of the mountain interior was year-around. Resident groups who viewed the mountains as their primary homeland occupied the mountain interior of Colorado, at least during the Early Archaic and probably during other periods as well. Lowland based groups may have competed for the resources of the high country, but evidence thus far argues more strongly that mountain-based groups dominated the high country.

Mountain Ecology

The mountains of Colorado form a north-south band, bordered by high plateaus on the west and by the High Plains on the east. The flanks and interior parks and valleys of these mountains have a high degree of ecological diversity, resulting from the altitudinal zonation of plant and animal communities. Models of seasonal forays into the mountains on the part of lowland based groups are based partly on the premise of prehistoric groups

altitudes as temperatures get warmer and snow-pack retreats. Interior mountains mobility models are based on the same general premise.

Figure 10.1 is an idealized cross-section of the Colorado River valley in the vicinity of Yarmony. The section would be similar for other major river valleys in the mountain interior, although some other river valleys are broader, less incised features with a wider flood plain-terrace sequence. In this graphic we show the habitat diversity common to the wide elevation ranges and variety of slopes and exposures in the mountains. Altitudinal zonation of vegetation types is evident, with topographic diversity contributing to community diversity within lifezones.

The Yarmony pit houses are situated within a grass-sagebrush-piñon-juniper savanna on sloping benchland well above the base elevation of the valley floor. In some sections of the valley, the slope is divided by piñon-juniper covered hogbacks, while elsewhere the valley sides slope directly to the river. Typical habitat types start with a riparian strip of cottonwood and willow along the river bottoms. Floodplains tend to be willow and wet grass meadows, but around Yarmony are mostly absent. Terraces tend to be open sagebrush-grassland steppe. Lower valley slopes are a mixed-shrub community including shrubby species, juniper, grasses and forbs. Slopes above the benchland are generally steeper and grade rapidly through piñon-juniper, montane and subalpine zones, terminating with alpine tundra above treeline.

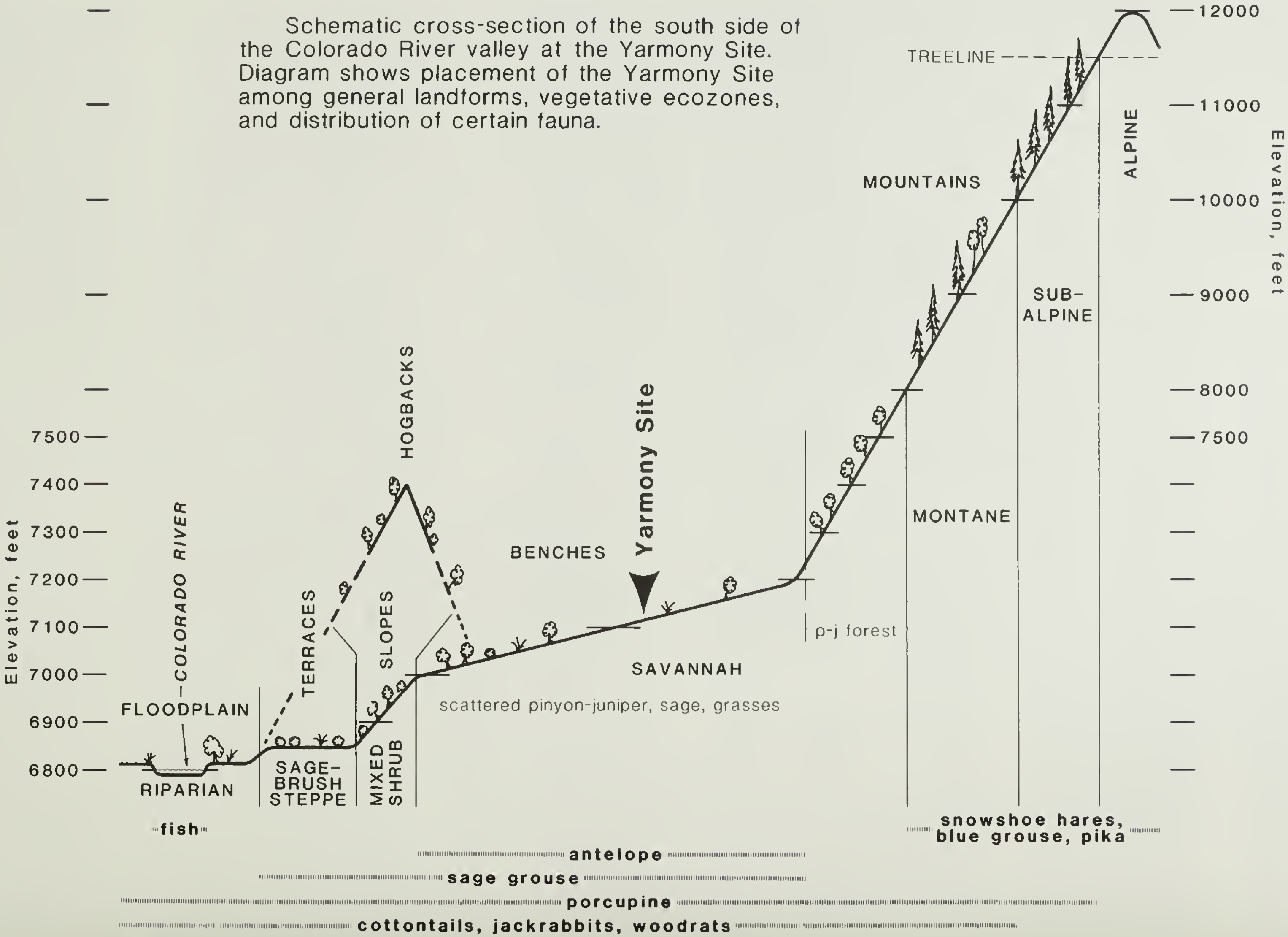
There is considerable species and community overlap between the various topographic features and elevational zones among plant and animal species. A key feature of the habitat diversity is the staggered seasonal availability of plant species resulting from sequential growing seasons at different elevations and exposures. Large ungulates (except antelope) use the entire elevation range while smaller mammals have more restricted ranges as shown on Figure 10.1.

Early Archaic Mountain Sites

A number of Early Archaic sites are known from the central and northern mountains of Colorado (Figure 10.2, Table 10.1). Two recently excavated sites, the Grange site (Black 1983) and the Radium Site (Metcalf n.d.) fit our model for lowland, probably spring occupations. These sites are located in major river valleys, Grange on a bench overlooking the Roaring Fork, and Radium on a low terrace of the Colorado, locations not far from Yarmony (Figure 10.2). While there are major differences between the two, each is characterized by a low valley setting, low lithic densities and the presence of ground stone. Grange appears to be single component, whereas Radium preserves multiple occupations within an Early Archaic-age soil. Each is indicative of short-term low intensity occupation and a non-hunting focus.

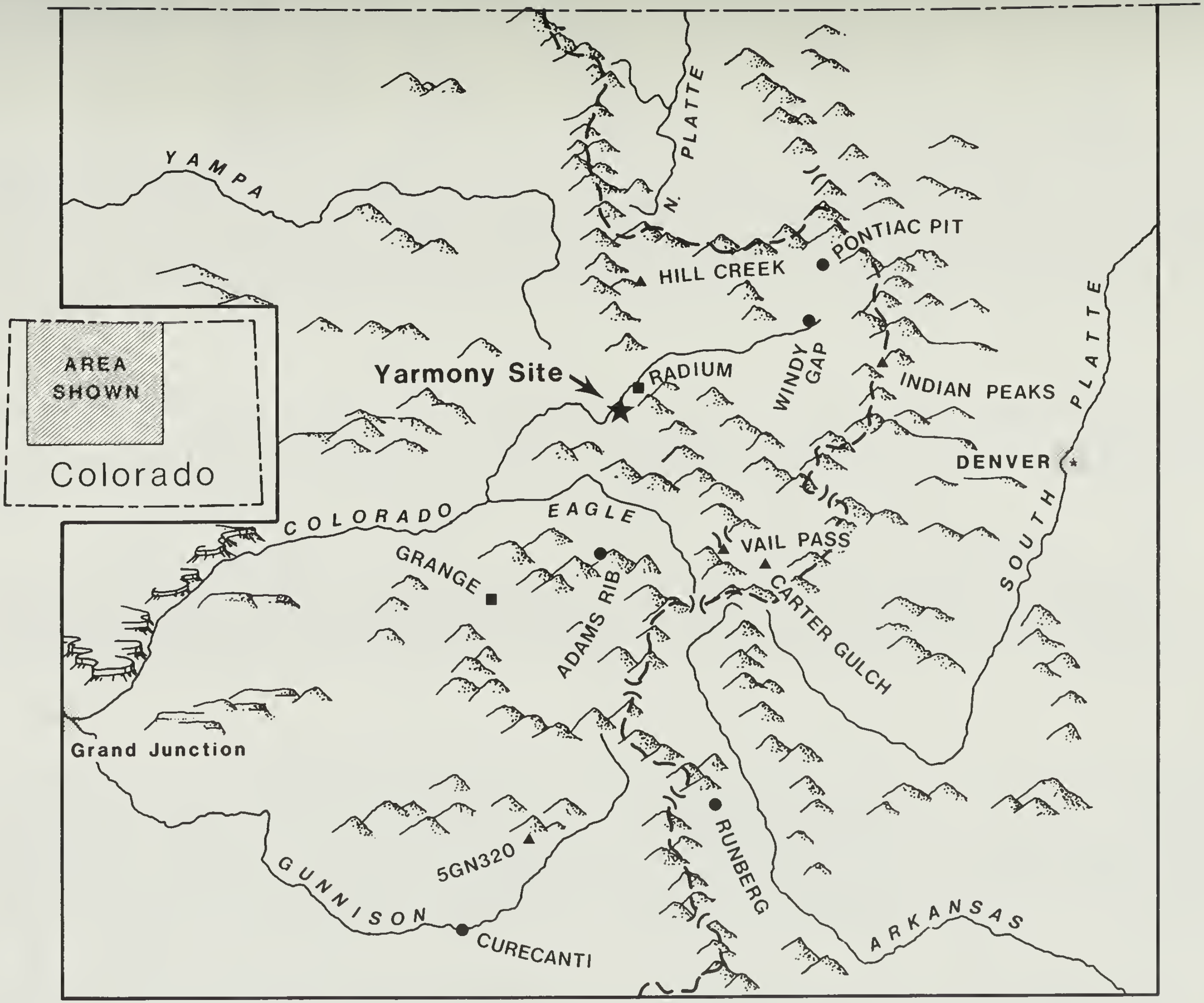
Structural remains, probably for short-term warm season use, have been found in Curecanti National Recreation Area west of Gunnison (Euler and Stiger 1981; Stiger 1981). At least five sites have yielded evidence of architectural remains with ^{14}C dates ranging from 8000 to 3300 BP (Jones 1984, 1986). Dominant among the house types are small, charcoal-filled basins, but the character of the fill - providing details on superstructure morphology - differs widely between and within the sites. These basins have yielded burned, pole-impressed

Schematic cross-section of the south side of the Colorado River valley at the Yarmony Site. Diagram shows placement of the Yarmony Site among general landforms, vegetative ecozones, and distribution of certain fauna.



CROSS-CANYON PROFILE OF ECOZONES

FIGURE 10.1



OTHER EARLY ARCHAIC SITES IN NORTHWESTERN COLORADO

FIGURE 10.2

Table 10.1

Early Archaic Radiocarbon Dates from the Central and Northern Colorado Rocky Mountains

Date	Lab Number	Site	Reference
4510±120	WSU-1750	Vail Pass	Gooding 1981
4516±120	Tx-3153	5GN200	Euler & Stiger 1981
4556±80	Tx-3151	5GN205	Euler & Stiger 1981
4620±95	I-8562	Ptarmigan	Benedict 1981
4665±140	Beta-4945	Granby	Wheeler & Martin 1984
4690±120	WSU-1755	Vail Pass	Gooding 1981
4700±95	I-8563	Ptarmigan	Benedict 1981
4710±120	Beta-6882	Pontiac Pit	Liestman 1984
4745±95	I-8280	Ptarmigan	Benedict 1981
4770±70	Beta-3420	5GA239	Wheeler & Martin 1984
4790±70	Beta-28131	Yarmony	this volume
4820±80	Beta-3568	Hill-Horn	Wheeler & Martin 1984
4950±220	Beta-5565	5GN222	Jones 1986b
4960±80	Beta-3567	Hill-Horn	Wheeler & Martin 1984
5000±100	Beta-3020	Carter Gulch	Black 1983
5080±130	Beta-27050	Radium	Metcalf n.d.
5230±80	Beta-3021	Carter Gulch	Black 1983
5250±70	Beta-4704	Granby	Wheeler & Martin 1984
5280±90	Beta-25876	Radium	Metcalf n.d.
5290±100	Beta-2974	5GA672	Martin *et al.* 1981
5300±130	I-4418	Hungry Whistler	Benedict & Olson 1978
5350±130	I-4419	5BL70	Benedict & Olson 1978
5390±100		5GA238	Burney *et al.* 1979
5410±130	Beta-2101	5GN196	Jones 1982
5416±160	Tx-3622	5GN206	Stiger 1981
5430±90	Beta-3287	5GN191	Jones 1986a
5455±120	UGa-3167	5GN320	Black *et al.* 1981
5500±70	Beta-5995	5GA128	Wheeler & Martin 1984
5520±190	I-9434	Hungry Whistler	Benedict & Olson 1978
5600±120	Beta-3289	5GN191	Jones 1986a
5605±560	Tx-3628	5GN10	Stiger 1981
5650±145	I-3023	5BL70	Benedict & Olson 1978
5685±170	Tx-3155	5GN191	Euler & Stiger 1981
5710±115	ETH-3589	Coney Lake	Benedict 1990
5720±90		5GA238	Wheeler & Martin 1984
5730±130	I-3817	Hungry Whistler	Benedict & Olson 1978
5730±140	Beta-2105	5GN210	Jones 1982
5770±80	Beta-3290	5GN191	Jones 1986a
5790±90	Beta-3294	5GN191	Jones 1986a
5800±125	I-3267	Hungry Whistler	Benedict & Olson 1978
5804±120	Tx-3152	5GA191	Euler & Stiger 1981
5810±100	Beta-3284	5GN222	Jones 1986a
5854±600	Tx-3625	5GN10	Stiger 1981
5860±90	Beta-3293	5GN191	Jones 1986a
5860±90	Beta-3280	5GN222	Jones 1986a
5870±100	Beta-3566	Hill-Horn	Wheeler & Martin 1984
5874±160	Tx-3619	5GN10	Stiger 1981
5880±120	I-6544	Fourth of July	Benedict 1981

cont'd

Table 10.1 cont'd

Date	Lab Number	Site	Reference
5895±950	Tx-3646	5GN191	Euler & Stiger 1981
5920±120	Beta-3292	5GN191	Jones 1986a
5960±230	Beta-3666	5GA128	Wheeler & Martin 1984
5960±90	Beta-3565	Hill-Horn	Wheeler & Martin 1984
6030±100	Beta-25076	Yarmony	this volume
6040±200	Beta-2099	5GN212	Jones 1982
6045±120	I-6545	Fourth of July	Benedict 1981
6080±100	Beta-25079	Yarmony	this volume
6095±250	Tx-3623	5GN212	Stiger 1981
6100±125	Beta-4948	Granby	Wheeler & Martin 1984
6120±140	Beta-4944	Granby	Wheeler & Martin 1984
6164±210	Tx-3621	5GN10	Stiger 1981
6205±170	I-10976	Ptarmigan	Benedict 1981
6210±110	Beta-2104	5GN222	Jones 1982
6220±110	Beta-3422	Hill-Horn	Wheeler & Martin 1984
6240±130	Beta-3283	5GN191	Jones 1986a
6270±140	Beta-3291	5GN191	Jones 1986a
6290±150	Beta-23788	Yarmony	Metcalf & Black 1987
6290±70	Beta-25077	Yarmony	this volume
6304±340	Tx-3627	5GN10	Stiger 1981
6320±90	Beta-21197	Yarmony	Metcalf & Black 1987
6330±110	Beta-25075	Yarmony	this volume
6450±110	I-7458	Ptarmigan	Benedict 1981
6545±160	Tx-3647	5GN191	Euler & Stiger 1981
6620±300	Beta-27103	Hill Creek	Rood 1989
6750±120	WSU-1752	Vail Pass	Gooding 1981
6750±100	Beta-3275	5GN212	Jones 1986a
6820±130	Beta-3273	5GN53	Jones 1986a
6860±190	Beta-2097	5GN212	Jones 1982
6860±100	Dic-2328	Hill-Horn	Wheeler & Martin 1984
6885±115	UGa-1148	Vail Pass	Gooding 1981
7050±150	Beta-12754	Grange	Black 1985
7050±200	Beta-25078	Yarmony	this volume
7054±110	Tx-3156	5GN205	Euler & Stiger 1981
7170±150		5GA238	Wheeler & Martin 1984
7170±200	Beta-2976	Granby	Wheeler & Martin 1982
7190±280	Beta-5132	Granby	Wheeler & Martin 1984
7320±160	WSU-1754	Vail Pass	Gooding 1981
7400±100	Beta-3272	5GN57	Jones 1984, 1986a
7400±190	Beta-2973	5GA670	Martin *et al.* 1981
7450±330	Beta-8119	Ponderosa	Dial 1984
7460±110	Beta-3295	5GN191	Jones 1984, 1986a
7650±190	I-3266	5BL70	Benedict & Olson 1978
7653±240	Tx-3624	5GN191	Stiger 1981
7740±140	Beta-14922	Runberg	Black 1986
7820±80	Beta-2975	5GA128	Lischka 1976
7960±140	Beta-3192	Hill-Horn	Wheeler & Martin 1982
7980±120	Beta-14182	Runberg	Black 1986
8030±210	Beta-8120	Ponderosa	Dial 1984
8365±190	UGa-4168	5LK372	Arthur 1981
8540±140	Beta-8123	Ponderosa	Dial 1984
8543±100	Tx-3149	5GN191	Euler & Stiger 1981
8650±110	Beta-14185	Runberg	Black 1986
8730±140	Beta-4705	Granby	Wheeler & Martin 1984
8840±100	Beta-14921	Runberg	Black 1986

clay at 5GN204/205 and 5GN247 (Euler and Stiger 1981; Jones 1986a), charred timbers in an arrangement of radiating spokes at 5GN10 (Stiger 1981; Mueller and Stiger 1983), concentrations of burned pole- and grass-impressed clay at 5GN53 and 5GN247 (Jones 1986a) and scattered burned clay at 5GN42 (Dial 1985; see summary in Jones 1986a:210-211).

Not all of these structures served as habitations, no direct data relating to seasonality are available, and none of these features is as complex or patterned as the pit houses at Yarmony. The bulk of the data, including relatively low artifact densities and limited storage facilities, suggests shorter term occupations than at Yarmony, and warm season rather than cool/cold season use. Such interpretations are disputed, however, even among the different investigators at Curecanti.

All of the remaining sites yielding Archaic architecture on Colorado's Western Slope have been found in the Colorado River valley system. The oldest of these sites are found at the highest elevations, in Middle Park near the river's headwaters. The Hill-Horn and Granby sites lay at elevations averaging 2500m (8200 ft) in the eastern quarter of Grand County, and were intensively investigated in 1981-82 for the Windy Gap Project (Wheeler and Martin 1982, 1984). No shape is preserved to the numerous structures at the sites; the evidence consists of concentrations of burned, pole-impressed clay similar to some of the remains at Curecanti, albeit the Windy Gap features are not in charcoal-filled basins. Radiocarbon dates range from 7960 to 3750 BP and thus, both morphologically and chronologically, the Windy Gap data parallel the results from the more extensive Curecanti excavations. Unfortunately, neither project has yielded much in the way of diagnostic artifacts from the various structural features.

Non-structural sites thought to be summer base camps include a suite of multi-component sites in the upper montane zone on a tributary of the Eagle River labeled here as Adam's Rib after a proposed ski area of the same name (Metcalf *et al.* 1981). These sites are large, have dense lithic assemblages, mixed, high diversity tool kits, and relatively abundant ground stone. Other summer bases include Pontiac Pit (Liestman 1984) and the Runberg Site (Black 1986). Pontiac Pit had been largely destroyed prior to excavation. Runberg is multiple component, but appears to have been a short-term base camp through most of its occupations including the Early Archaic, again basing this interpretation on tool kit diversity, ground stone and general intensity of site use. Components of several of the Curecanti sites would fall into this category as well.

Short-term camps or locations include 5GN320 (Black *et al.* 1981), Vail Pass (Gooding 1981), Carter Gulch (Black 1983), Hill Creek (Rood 1990), and four sites with Early Archaic components in the Indian Peaks Wilderness: Hungry Whistler and Ptarmigan (Benedict and Olson 1979), Fourth of July Valley (Benedict 1981), and Coney Lake (Benedict 1990). Elevations for these sites range from just over 8000 ft to in excess of 11,000 ft. Low lithic densities are common and, on the higher elevation sites, curation and reuse of tools occurs. Some ground stone occurs along with a general hunting tool kit. Where multiple occupations and compressed stratigraphies are not a problem, components seem to be small with just a few contemporary firepit features.

Specialized locations in the mountains include various kinds of sites, both spectacular and mundane. Game drive systems in the Front Range (Benedict and Olson 1979; Benedict 1990) and elsewhere (Morris 1989; Hutchinson 1989) are perhaps the most visible. Major lithic procurement sites associated with high quality raw materials including Table Mountain Jasper, Kremmling or Miocene chert (Miller 1989), Windy Ridge quartzite (Nykamp 1988), Trout Creek Pass chert (Chambellan *et al.* 1984) occur as do sites associated with sources of a variety of cherts associated with the sedimentary sequence which includes the Leadville Limestone in the central mountains (Bryant 1979; Black and Metcalf 1988).

Survey projects have reported numerous sites which could be termed as stations and locations. These include a number of sites at high elevations in the mountains (e.g. Benedict 1990; Morris *et al.* in press; Metcalf and Black 1985) which are certain, on the basis of location, to be warm season extractive and "information" gathering sites. Numerous surveys at lower elevations in the mountain interior have recorded literally hundreds of sites which fit the same functional classifications, but which are accessible over much more of the year.

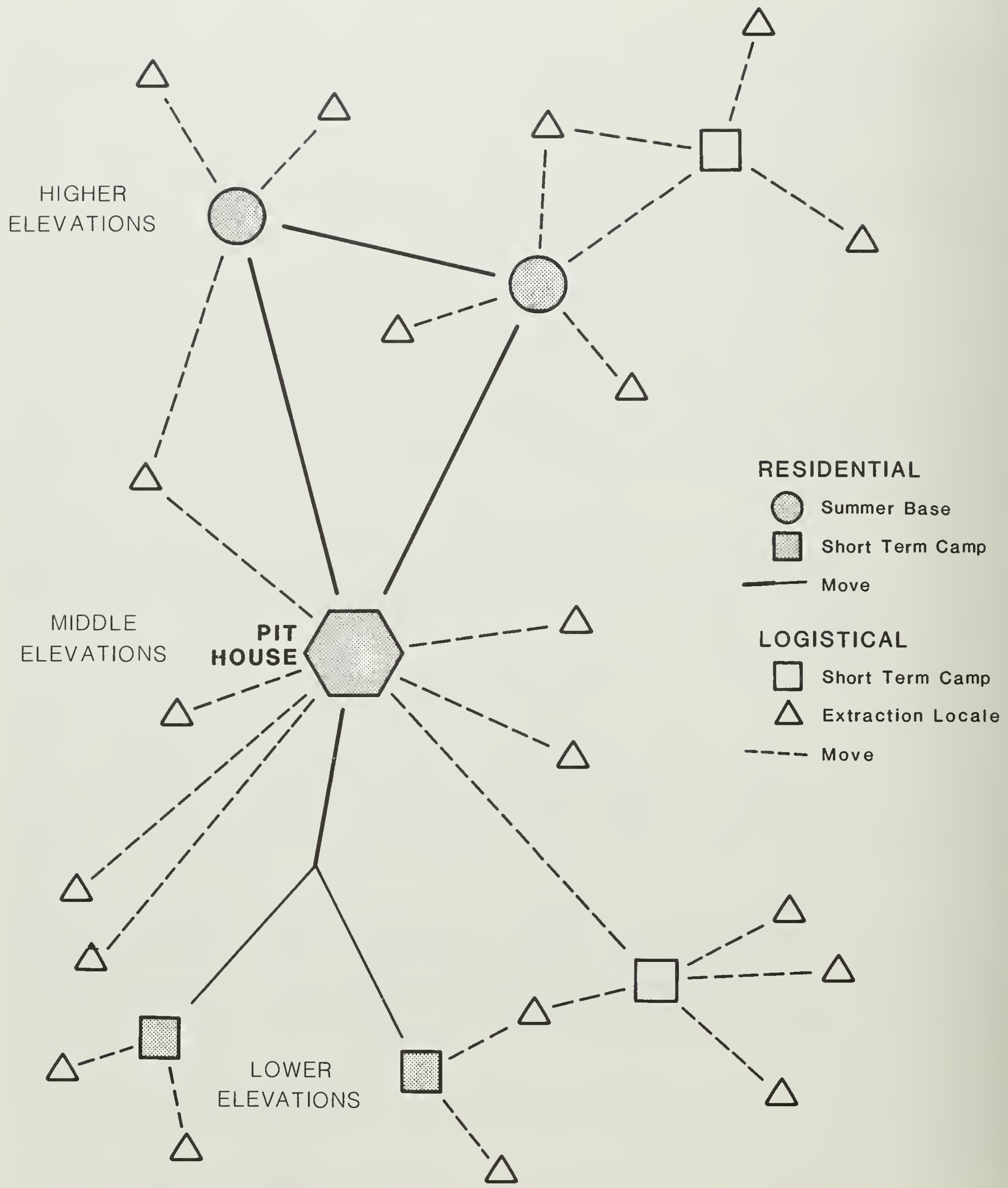
The Model

Figure 10.3 diagrams an idealized settlement pattern with Yarmony at its center. Circles represent residential base camps, squares short-term camps, and triangles locations. Solid lines indicate residential moves, and dashed lines are logistical moves.

The winter residence was probably a small community with one to three structures occupied by extended families at a given time. Multiple communities are envisioned to have existed within a larger area. Placement was within winter range of large mammals, above the base elevation of the valley to avoid the cold air drainage pattern, and in a location with an open exposure. Subsistence was on stored foods, large mammals hunted in the restricted area of their winter range, and on a few other resources such as fish and small mammals that might be available.

Spring was probably the toughest time of year. Few plants have ripened and animals are in poor condition and are beginning to disperse as the snow pack leaves. In good years the house structures would continue to be viable as the group residence, with logistical trips made in the low country for fish, fresh greens, early seeds and roots. The hunting range is slightly expanded and the house would continue to be within a reasonable distance of resources. In leaner years we suggest that dispersal of the settlement into several short-term residential camps located further away may have been necessary. Sites such as Radium and Grange would fit into the category of early season short-term camps or locations.

Residential base camps formed the locus of summer occupations. We envision a single base camp as being adequate for several households with several base camps occupied sequentially through residential moves. Summer base camps are seen as a sort of secondary hub with relatively easy access to a variety of resources. Logistical trips back to the house site for stockpiling of resources such as tool stone and wood and storage of seeds were probably common. Summer bases were located in the upper montane and subalpine zones with locations and short-term logistical camps loosely tethered to these areas.



SETTLEMENT PATTERN

FIGURE 10.3

Successively higher elevations were probably used until mid-summer. Sites such as those at Curecanti, Adam's Rib, and Hill-Horn and Granby fit the model here.

Late summer, fall and early winter would see the greatest effort in hunting, processing of meat products and storage. Animals would be in good condition and nutritional yields and conditions for storage would be at their best. Game drive facilities at high altitudes might be a part of this pattern. Under modern conditions, freezing would be possible after mid-November, but concentrating methods such as pemmican, drying, and marrow/grease storage are more likely. Caching near, or direct storage at, the house locations was probably done. Late fall-early winter saw permanent residence back at the house site.

So far, our proposed model is based on resource possibilities, seasons of snow cover, and a single site with positive evidence of seasonality. Obviously, high altitudes would not be winter sites, but closer evidence of seasonality is lacking from the majority of sites. Ideally, we would work to tighten this model by locating and excavating other Early Archaic sites in the immediate site area and conducting a more detailed analysis of each component's assemblage. Functional analyses, including edge angle and shape, use wear, tool kit diversity measures, debitage characteristics, artifact densities and feature associations should be aimed at interpreting the range of functions within each site. Site functions, as determined analytically, should match the model's expectations in terms of elevation range and site placement. Material type analysis should prove useful for estimating territory size.

Conclusions

Expectations generated from evidence for subsistence and mobility at Yarmony suggest a settlement pattern with winter sedentism as the major focal point. A small annual range is suggested by an overwhelming dominance of local material types within all classes of lithic items. Resource possibilities within the area where this stone is available suggest that the Colorado River bottom in the local area is the base elevation of an annual range that includes all life zones in the area. Ethnographic data show at least a bi-seasonal settlement pattern to occur with pit structure use, so warm season camps of various types can be predicted to occur. Seasons of snow cover and resource availability allow some predictions of season of occupation at elevations above Yarmony, and some excavated sites in the mountains match our general expectations for site placement and function. The utility of our model is best demonstrated at Yarmony in the indications of a high degree of sedentism within a relatively small annual territory. Complex warm season camp sites, such as those at Adam's Rib, lend additional support while specialized extractive and processing sites associated with primary habitation sites require more intensive study to clarify their role within our model.

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